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Office of Chemical Safety and
Pollution Prevention

Data Quality Evaluation and Data Extraction Information for Environmental Fate and Transport for Asbestos Part 2 – Supplemental Evaluation Including Legacy Uses and Associated Disposals of Asbestos

Systematic Review Support Document for the Risk Evaluation

CASRN: 1332-21-4

November 2024

This supplemental file contains information regarding the data extraction and evaluation results for data sources that were considered for the Supplement to the *Risk Evaluation for Asbestos Part 2: Supplemental Evaluation Including Legacy Uses and Associated Disposals of Asbestos* that underwent systematic review. EPA used the TSCA systematic review process described in the *Draft Systematic Review Protocol Supporting TSCA Risk Evaluations for Chemical Substances* (also referred to as the '2021 Draft Systematic Review Protocol'). The systematic review steps are further described in the *Risk Evaluation for Asbestos Part 2: Supplemental Evaluation Including Legacy Uses and Associated Disposals of Asbestos – Systematic Review Protocol*. EPA conducted data extractions and data quality evaluations based on author-reported descriptions and results; additional analyses (*e.g.*, statistical analyses) potentially conducted by EPA are not contained in this supplemental file.

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4140459	Choi, I., Smith, R. W. (1972). Kinetic study of dissolution of asbestos fibers in water. Journal of Colloid and Interface Science 40(2):253-262.	**8**
3101124	Clark, S. G., Holt, P. F. (1961). Studies on the chemical properties of chrysotile in relation to asbestosis. Annals of Occupational Hygiene 3(1):22-29.	**10**
5353542	Gronow, J. R. (1987). The dissolution of asbestos fibres in water. Clay Minerals 22(1):21-35.	**12**
3584211	Thom, J. G. M., Dipple, G. M., Power, I., Harrison, A. L. (2013). Chrysotile dissolution rates: Implications for carbon sequestration. Applied Geochemistry 35:244-254.	**14**
6859826	Walter, M., Schenkeveld, W. D. C., Reissner, M., Gille, L., Kraemer, S. M. (2019). The Effect of pH and Biogenic Ligands on the Weathering of Chrysotile Asbestos: The Pivotal Role of Tetrahedral Fe in Dissolution Kinetics and Radical Formation. Chemistry: A European Journal 25(13):3286-3300.	**16**
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3978350	NICNAS, (1999). Chrysotile asbestos: priority exisiting chemical no. 9.	**18**
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3093600	Belanger, S. E., Cherry, D. S., Cairns J, , J. R. (1986). Uptake of chrysotile asbestos fibers alters growth and reproduction of Asiatic clams. Canadian Journal of Fisheries and Aquatic Sciences 43(1):43-52.	**20**
3093856	Belanger, S. E., Cherry, D. S., Cairns J, , J. R. (1986). Seasonal behavioral and growth changes of juvenile Corbicula-fluminea exposed to chrysotile asbestos. Water Research 20(10):1243-1250.	**23**
3585046	Belanger, S. E., Cherry, D. S., Cairns, J. (1990). Functional and pathological impairment of japanese medaka (Oryzias latipes) by long-term asbestos exposure. Aquatic Toxicology 17(2):133-154.	**25**
3584230	Belanger, S. E., Cherry, D. S., Cairns, J., Mcguire, M. J. (1987). Using Asiatic clams as a biomonitor for chrysotile asbestos in public water supplies. Journal of the American Water Works Association 79(3):69-74.	**27**
3584231	Belanger, S. E., Schurr, K., Allen, D. J., Gohara, A. F. (1986). Effects of chrysotile asbestos on coho salmon and green sunfish: evidence of behavioral and pathological stress. Environmental Research 39(1):74-85.	**30**
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6882558	Davenport, M. S. (1993). Water-Quality and Biological Data for Selected Streams, Lakes, and Wells in the High Point Lake Watershed, Guilford County, North Carolina, 1988-89.	**32**
3860485	(2017). PubChem: Chrysotile.	**34**
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786664	ATSDR, (2001). Toxicological profile for asbestos (Update, September 2001).	**36**
10190487	Avataneo, C., Belluso, E., Capella, S., Cocca, D., Lasagna, M., Pigozzi, G., De Luca, D. A. (2021). GROUNDWATER ASBESTOS POLLUTION FROM NATURALLY OCCURRING ASBESTOS (NOA): A PRELIMINARY STUDY ON THE LANZO VALLEYS AND BALANGERO PLAIN AREA, NW ITALY. (Special Issue):5-9.	**46**
3582727	Bales, R. C., Newkirk, D. D., Hayward, S. B. (1984). CHRYSOTILE ASBESTOS IN CALIFORNIA SURFACE WATERS - FROM UPSTREAM RIVERS THROUGH WATER-TREATMENT. Journal of the American Water Works Association 76(5):66-74.	**48**
3745359	Buckley, S. G., Lipkin, J., Baxter, L. L., Moehrle, R., Ross, J. R., Mower, G., Munson, W. (2000). Cofiring of propellant washout residue with traditional boiler fuels: Resolution of operational and environmental issues. NATO science series, II: mathematics, physics and chemistry, vol. 3 3:37-48.	**52**
10066999	Carneiro, G. O., Santos, T. A., Simonelli, G., Ribeiro, D. V., Cilla, M. S., Dias, C. M. R. (2021). Thermal treatment optimization of asbestos cement waste (ACW) potentializing its use as alternative binder. Journal of Cleaner Production 320:28801-28801.	**54**
6871198	Gaggero, L., Caratto, V., Ferretti, M. (2016). Self-sustained combustion synthesis and asbestos-bearing waste: Scaling up from laboratory towards pre-industrial size plant. Energy Procedia 97:515-522.	**60**
3582756	Gualtieri, A. F., Gualtieri, M. L., Tonelli, M. (2008). In situ ESEM study of the thermal decomposition of chrysotile asbestos in view of safe recycling of the transformation product. Journal of Hazardous Materials 156(1-3):260-266.	**62**
6898503	Henson, E. B. (1985). Asbestos fibers in lakes and streams. Verhandlungen: Internationale Vereinigung für Theoretische und Angewandte Limnologie 22(4):2232-2237.	**64**
3583339	Hunsinger, R. B., Roberts, K. J., Lawrence, J. (1980). CHRYSOTILE ASBESTOS FIBER REMOVAL DURING POTABLE WATER-TREATMENT - PILOT-PLANT STUDIES. Environmental Science and Technology 14(3):333-336.	**66**
6868399	Jolicoeur, C., Duchesne, D. (1981). INFRARED AND THERMOGRAVIMETRIC STUDIES OF THE THERMAL-DEGRADATION OF CHRYSOTILE ASBESTOS FIBERS - EVIDENCE FOR MATRIX EFFECTS. Canadian Journal of Chemistry 59(10):1521-1526.	**68**
6893656	Kebler, D. G., Bales, R. C., Amy, G. L. (1989). Coagulation of submicron colloids by supramicron silica particles. Water Science and Technology 21(6-7):519-528.	**70**
6892106	Lauer, W. C., Convery, J. J. (1988). Status of the Potable Water Reuse Demonstration Project at Denver. :443-474.	**72**
3585188	Lawrence, J., Zimmermann, H. W. (1977). ASBESTOS IN WATER - MINING AND PROCESSING EFFLUENT TREATMENT. Journal of Water Pollution Control Federation 49(1):156-160.	**74**
3662078	Lawrence, J., Zimmermann, H. W. (1976). Potable water treatment for some asbestiform minerals: optimization and turbidity data. Water Research 10(3):195-198.	**76**
3581621	Mcguire, M. J., Bowers, A. E., Bowers, D. A. (1983). OPTIMIZING LARGE-SCALE WATER-TREATMENT PLANTS FOR ASBESTOS-FIBER REMOVAL. Journal of the American Water Works Association 75(7):364-370.	**78**
3978350	NICNAS, (1999). Chrysotile asbestos: priority exisiting chemical no. 9.	**80**
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2663454	Osada, M., Takamiya, K.,en, Manako, K., Noguchi, M., Sakai, S. I. (2013). Demonstration study of high temperature melting for asbestos-containing waste (ACW). Journal of Material Cycles and Waste Management 15(1):25-36.	**84**
6899950	Ottaviani, M., Marconi, A., Magnatti, P. (1986). Asbestos Fiber Removal During Effluent Wastewater Treatment. Pilot Plant Evaluation. Studies in Environmental Science 29:335-343.	**86**

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3581347	Porcu, M., Orru, R., Cincotti, A., Cao, G. C. (2005). Self-propagating reactions for environmental protection: Treatment of wastes containing asbestos. Industrial and Engineering Chemistry Research 44(1):85-91.	**90**
6896703	Promentilla, M. A. B., Peralta, G. L. (2003). An evaluation of landfill disposal of asbestos-containing waste and geothermal residues within a risk-assessment framework. Journal of Material Cycles and Waste Management 5(1):13-21.	**92**
1237202	Sakai, S., Takatsuki, H., Hiraoka, M., Tsunemi, T. (1991). Sludge melting process with hazardous asbestos wastes. Water Science and Technology 23(10-12):2029-2037.	**94**
3583145	Schmitt, R. P., Lindsten, D. C., Shannon, T. F. (1977). DECONTAMINATING LAKE-SUPERIOR OF ASBESTOS FIBERS. Environmental Science and Technology 11(5):462-465.	**96**
3583161	Schreier, H., Lavkulich, L. (2015). Cumulative effects of the transport of asbestos-rich serpentine sediments in the trans-boundary Sumas Watershed in Washington State and British Columbia. Canadian Water Resources Journal 40(3):262-271.	**98**
1917037	Schreier, H., Omueti, J. A., Lavkulich, L. M. (1987). Weathering processes of asbestos-rich serpentinitic sediments. Soil Science Society of America Journal 51(4):993-999.	**100**
6896746	Schreier, H., Taylor, J. (1981). Variations and Mechanisms of Asbestos Fibre Distribution in Stream Water.	**102**
5353620	Speil, S., Leineweber, J. P. (1969). Asbestos minerals in modern technology. Environmental Research 2(3):166-208.	**104**
6895656	Srivastava, S. K., Ramanathan, A. L. (2018). Assessment of landfills vulnerability on the groundwater quality located near floodplain of the perennial river and simulation of contaminant transport. Modeling Earth Systems and Environment 4(2):729-752.	**106**
3080106	Trivedi, A. K., Ahmad, I., Musthapa, M. S., Ansari, F. A., Rahman, Q. (2004). Environmental contamination of chrysotile asbestos and its toxic effects on growth and physiological and biochemical parameters of Lemna gibba. Archives of Environmental Contamination and Toxicology 47(3):281-289.	**108**
10190686	Witek, J., Psiuk, B., Naziemiec, Z., Kusiorowski, R. (2019). Obtaining an artificial aggregate from cement-asbestos waste by the melting technique in an arc-resistance furnace.	**110**
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3583161	Schreier, H., Lavkulich, L. (2015). Cumulative effects of the transport of asbestos-rich serpentine sediments in the trans-boundary Sumas Watershed in Washington State and British Columbia. Canadian Water Resources Journal 40(3):262-271.	**112**
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OECD Harmonized Template:	Hydrolysis
HERO ID:	3582724

EXTRACTION

Parameter	**Data**
CASRN and Test Material	1332-21-4; Asbestos
Confidentiality, Type, Guideline	None; Experimental; other: absorption properties of chrysotile asbestos aging in water
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	No; NR; NR; Impurities were removed by aqueous decanting and stirring, with the resulting material having physical characteristic lide fibers found in natural waters Notes: raw chrysotile ore, measured surface area 48.5 m2/g
Buffer, Test Temperature, Number of Replicates	Not reported; not reported, but held constant; Not reported
Positive Controls and Negative Controls	Positive: Not reported; Negative: Not reported
pH and Duration	Not reported; 3-5 days
Sampling Frequency and Test Setup	12 hours; Dissolution and surface-charge behavior were monitored in constant-pH, constant-temperature suspensions of 2 g of chrysotile/200 mL of 0.01-0.1 M electrolyte (KNO3, NaN03, NaC1, or Na2S04). A constant-pressure N2 or N2-CO2 atmosphere was maintained.
Concentration	10 g/L
Analytical Method, Analytical Details, and Statistics	particle electrophoresis apparatus; Electrolyte concentrations were 0.01 M, the mobility of particles at constant pH was monitored for 24-48 h. A known concentration of organic acid was added, and mobility was monitored for 24-48 h longer.; A quasi-equilibrium comparison using a Langmuir-type equation.
Transformation Products	Not reported
Reference Substance and Reference Substance Results	Not reported; Not reported
Percent Recovery, Hydrolysis Rate Constant, and Half-life	Not reported; Dissolution of Chrysotile; Not reported
Results Remarks	Chrysotile in natural water acquires a negative surface charge by rapid adsorption of natural organic matter (<1 day). Positively charged >Mg-OH2+ sites are removed by dissolution in the outer brucite sheet resulting in exposure of underlying >SiO- sites.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Test Substance			
Metric 1:	Test Substance Identity	High	The test substance was identified by common name.
Metric 2:	Test Substance Purity	Medium	The purity of the original ore was not provided; however, this omission was not likely to impact on the results.
Domain 2: Test Design			
Metric 3:	Study Controls	N/A	The metric is not applicable to this study type.
Metric 4:	Test Substance Stability	High	The test substance is stable under the test conditions.
Domain 3: Test Conditions			
Metric 5:	Test Method Suitability	High	The test method was suitable for the test substance.

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Study Citation:	Bales, R. C., Morgan, J. J. (1985). SURFACE-CHARGE AND ADSORPTION PROPERTIES OF CHRYSOTILE ASBESTOS IN NATURAL-WATERS. Environmental Science and Technology 19(12):1213-1219.
OECD Harmonized Template:	Hydrolysis
HERO ID:	3582724

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 6:	Testing Conditions	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 7:	Testing Consistency	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 8:	System Type and Design	Medium	Some system and design information was not reported, but the omissions were not likely to impact on the results.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 12:	Test Substance Purity	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	High	No confounding variables were reported.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	Calculations were described and assumptions used in their interpretation were also stated.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

Overall Quality Determination High

Study Citation:	Choi, I., Smith, R. W. (1972). Kinetic study of dissolution of asbestos fibers in water. Journal of Colloid and Interface Science 40(2):253-262.
OECD Harmonized Template:	Hydrolysis
HERO ID:	4140459

EXTRACTION

Parameter	Data
CASRN and Test Material	1332-21-4; Chrysotile asbestos
Confidentiality, Type, Guideline	None; Experimental; other: Non-guideline, kinetic dissolution of asbestos minerals in water from 5 to 45°C
Solvent, Reactivity, Storage, Stability	Deionized distilled water; NR; NR; Heat resistant; high tensile strength
Radiolabel, Source, State, Purity	NR; Chrysotile asbestos from Quebec, Canada was obtained from Ward's Natural Science Establishment, Inc., Rochester, N.Y.; Block form; fine particles prepared with mortar and pestle and by dry grinding with a pebble mill and sized by sieving. The minus-325-mesh fraction was used for experiments.; NR Notes: The mineral is a hydrated magnesium orthosilicate containing a high percentage of magnesia and water; formula expressed as Mg3Si2O5(OH)4 or 3MgO·2SiO2·2H2O
Buffer, Test Temperature, Number of Replicates	Not reported; 5, 15, 25, 25, 45°C; Not reported
Positive Controls and Negative Controls	Positive: Not reported; Negative: Not reported
pH and Duration	Initial pH=6; pH 5.9-6.1 of the DI-water; the pH of the chrysotile-containing suspension was measured after water was added and pH was monitored over time.; 20-1000 minutes
Sampling Frequency and Test Setup	Continuous monitoring; Sample size and temperature effect on pH at 100 cc water; pH change over long period with 3 gm -120-mesh and 100 mg -325-mesh in 100cc; pH change comparing 3 fractions of asbestos minerals, including amosite and crocidolite prepared like chrysotile
Concentration	0.01 - 0.1 %
Analytical Method, Analytical Details, and Statistics	No standard method cited; pH measurements were continuously recorded as a function of time using an electrometer connected to a strip-chart recorder. Mg2+ was measured by a specific divalent cation electrode as a function of time.; Hydroxyl ion increases in solution logarithmically with reaction time at room temp; as sample size increased time for equilibration decreased; the surface of asbestos behaved like Mg-oxide Mg-hydroxide in terms of changing water pH.
Transformation Products	Chrysotile asbestos dissolution in water is a two step process, 1st OH- diffuse into solution, 2nd Mg2+ are extracted from the surface; overall reaction: Mg3Si2O5(OH)4 + 5H20=3Mg2+=6OH- + 2H4SiO4.
Reference Substance and Reference Substance Results	not reported; NOTE: Dissolution of magnesium from ground as opposed to unground asbestos is temperature dependent; this was attributed to the high metal content found in ground samples.
Percent Recovery, Hydrolysis Rate Constant, and Half-life	Not Reported; Not Reported; Initial rate of dissolution = 3.06 x 10 ^-2 M/min. Rate of dissolution is a function of surface area and temperature. Mg2+ may be continuously liberated from fibers leaving a silica skeleton. The rate-controlling step was determined to be removal of brucite layer. Smaller particles liberated more Mg.
Results Remarks	Note: after extended time Mg-complexes may be formed and MgOH+ complex may readsorb back to exposed silica skeleton surface (which is likely negatively charged).

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified by chemical name.
	Metric 2:	Test Substance Purity	Medium	Source indicated but purity was not reported; however, the omission was not likely had to have an impact on the study results.
Domain 2: Test Design				
	Metric 3:	Study Controls	N/A	This metric is not applicable for this study.

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Study Citation:	Choi, I., Smith, R. W. (1972). Kinetic study of dissolution of asbestos fibers in water. Journal of Colloid and Interface Science 40(2):253-262.
OECD Harmonized Template:	Hydrolysis
HERO ID:	4140459

		EVALUATION		
Domain		Metric	Rating	Comments
	Metric 4:	Test Substance Stability	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 6:	Testing Conditions	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 7:	Testing Consistency	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 8:	System Type and Design	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	This metric is not applicable for this study.
	Metric 10:	Sampling Methods	N/A	This metric is not applicable for this study.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Medium	There were minor differences between the outcome assessment methodology and the outcome of interest; however, the difference does not likely have a substantial impact on the study results.
	Metric 12:	Test Substance Purity	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	This metric is not applicable for this study.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 18:	QSAR Models	N/A	This metric is not applicable for this study.

Overall Quality Determination — High

Study Citation:	Clark, S. G., Holt, P. F. (1961). Studies on the chemical properties of chrysotile in relation to asbestosis. Annals of Occupational Hygiene 3(1):22-29.
OECD Harmonized Template:	Hydrolysis
HERO ID:	3101124

EXTRACTION

Parameter	**Data**
CASRN and Test Material	12001-29-5; Chrysotile fibre
Confidentiality, Type, Guideline	None; Experimental; other: Non-guideline; dissolution study under natural, acidic, and basic conditions
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; NR; NR; unknowncomposition Notes: Opened South African chrysotile fibre with fibrous asbestos
Buffer, Test Temperature, Number of Replicates	water, hydrochloric acid (0.1N) or sodium hydroxide (0.1N); 25°, 37° and 90°; Not applicable
Positive Controls and Negative Controls	Positive: Not reported; Negative: Not reported
pH and Duration	Not reported in water or NaOH, 1.5-2.4 in 0.1N HCl; 70 days
Sampling Frequency and Test Setup	1, 2, 3, 4, 5, 6, 7, 21, 28, 42, 56 and 70 days; Polythene bottles or Hysil glass flasks
Concentration	2 g/L
Analytical Method, Analytical Details, and Statistics	yellow silico-molybdate method; colorimetric; Not reported; Not reported
Transformation Products	MgO and SiO2
Reference Substance and Reference Substance Results	Not reported; Not reported
Percent Recovery, Hydrolysis Rate Constant, and Half-life	Not reported; Not reported; Not reported
Results Remarks	1.7 and <0.2 mg/100 mL MgO and SiO2 detected at 70 days at 25°C in water.100 and 20 mg/100 mL MgO and SiO2 detected at 132 days at 37°C in 0.1 N HCl. 0 and 0.1 mg/100 mL MgO and SiO2 detected at 49 days at 37°C in 0.1 N NaOH.

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified definitively.
	Metric 2:	Test Substance Purity	Medium	The test substance source was reported; however, the test substance contained impurities.
Domain 2: Test Design				
	Metric 3:	Study Controls	Low	The study did not require concurrent control groups.
	Metric 4:	Test Substance Stability	High	The test substance preparation was reported.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	The test method was suitable for the test substance.
	Metric 6:	Testing Conditions	Medium	There were omissions in the pH of the testing conditions.
	Metric 7:	Testing Consistency	High	Test conditions were consistent across samples or study groups. The conditions of the exposure were documented.

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Study Citation:	Clark, S. G., Holt, P. F. (1961). Studies on the chemical properties of chrysotile in relation to asbestosis. Annals of Occupational Hygiene 3(1):22-29.
OECD Harmonized Template:	Hydrolysis
HERO ID:	3101124

		EVALUATION	
Domain	Metric	Rating	Comments
	Metric 8: System Type and Design	Medium	There were omission in the system design details; however, system type and design were expected to be capable of appropriately maintaining substance concentrations.
Domain 4: Test Organisms			
	Metric 9: Outcome Assessment Methodology	N/A	The metric is not applicable to the study type.
	Metric 10: Sampling Methods	N/A	The metric is not applicable to the study type.
Domain 5: Outcome Assessment			
	Metric 11: Test Substance Identity	High	The outcome assessment methodology addressed or reported the intended outcome(s) of interest.
	Metric 12: Test Substance Purity	Medium	Details regarding sampling methods of the outcome(s) were not fully reported, however, the omissions were not likely to have a substantial impact on study results.
Domain 6: Confounding/Variable Control			
	Metric 13: Confounding Variables	Medium	Sources of variability and uncertainty in the measurements and statistical techniques and between study groups were reported in the study.
	Metric 14: Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to the study type.
Domain 7: Data Presentation and Analysis			
	Metric 15: Data Reporting	High	The transformation product(s) concentrations were reported.
	Metric 16: Statistical Methods and Kinetic Calculations	Low	Statistical analysis or kinetic calculations were not conducted or were not described clearly.
Domain 8: Other			
	Metric 17: Verification or Plausibility of Results	High	reported values were consistent with related physical chemical properties.
	Metric 18: QSAR Models	N/A	The metric is not applicable to the study type.

Overall Quality Determination — Medium

Study Citation:	Gronow, J. R. (1987). The dissolution of asbestos fibres in water. Clay Minerals 22(1):21-35.
OECD Harmonized Template:	Hydrolysis
HERO ID:	5353542

EXTRACTION

Parameter	Data
CASRN and Test Material	1332-21-4; Asbestos
Confidentiality, Type, Guideline	None; Experimental; other: Non-guideline; dissolution of asbestos in water at various pH and temperatures.
Solvent, Reactivity, Storage, Stability	Water (resistivity <18 megohm-cm, no element >10ppb); NR; NR; NR
Radiolabel, Source, State, Purity	NR; Chrysotile from Cape Asbestos Fibres Ltd in Thetford, Canada. Crocidolite from Turner Asbestos Fibres in Cape Province, South Africa.; Not Reported; NR Notes: Major elemental analysis (%): In chrysotile and crocidolite, respectively: SiO2: 39.01,51.08; Al2O3:0.41,8.34; Fe2O3:0.97,8.93; FeO:0.17,17.41; MgO:41.30,4.06; CaO:0.07,1.30; Na2O:0.01,6.14; K2O:0.01,0.06; H20-:2.48, 0.12; H2O+:13.1, 2.80, others <1%
Buffer, Test Temperature, Number of Replicates	0.05 M N,N-bis(2-hydroxyethyl)-2-aminotheane sulphonic acid used for pH 7; 0.05 M Tris (hydroxymethyl) aminomethane (TRIS) uses for pH 9; 0.05 M Tris (hydroxymethyl) aminomethane citrate (monobasic TRIC citrate) used for pH 4.; 44, 6, 25, 25, and 25°C, in experiments 1, 2, 3, 4, and 5.; One at each temperature/pH combination.
Positive Controls and Negative Controls	Positive: Not applicable; Negative: Not applicable
pH and Duration	7, 7, 7, 9, 4 in experiments 1, 2, 3, 4, and 5, respectively.; 170 hours for experiments 1, 2, 4, and 5. 1024 h for experiment 3.
Sampling Frequency and Test Setup	Samples analyzed 15 minutes after addition to reaction vessel, at 170 h (and 1024 h, for experiment 3), and at other unspecified time intervals.; Samples were hand-picked, milled for 5-15 min, and washed several times with acetone. 500 mg added to reaction vessel (1 l). 10mL aliquots were taken, filtered through a 0.1 um Millipore filter, acidified with ultra-grade HClO4, then analyzed using AAS.
Concentration	500 mg fibers/L
Analytical Method, Analytical Details, and Statistics	Atomic absorption spectroscopy (AAS); AAS used for Mg and Si analysis in crocidolite and chrysotile experiments. Also for Fe in crocidolite only.; Not reported
Transformation Products	Not reported
Reference Substance and Reference Substance Results	Not reported; Not reported
Percent Recovery, Hydrolysis Rate Constant, and Half-life	Not reported; Rate constant not explicitly provided. Activation energies at pH 7 were estimated from the measurement of Mg and Si dissolution with time. The apparent activation energy of chrysotile at pH 7 was ~27 kj/mole and 28 kj/mole for crocidolite.; Half-life was not calculated. Using the theoretical ppm of Mg and Si in one layer of chrysotile or crocidolite and their measured ppm in solution, the proportion of layers removed by dissolution was calculated.
Results Remarks	170 hours study results: Mg removed (proportion of 1 surface layer in ppm/layer): Experiments 1-4: 0.32-0.89. Exp 5 (pH 4, 25 C): 8.84. Si removed (proportion of 1 layer): Experiments 1-4: 0.5-0.25. Exp 5: 5.05. Crocidolite: Mg removed (proportion of 1 layer) in exp. 1-5: 1.41, 0.59, 0.96, 0.42, 1.80. Si removed (proportion of 1 layer): 0.56, 0.03, 0.16, 0.32, 0.48. 1024 h results [Exp. 3 only] (proportion of one layer removed): Chrysolite, Mg: 0.94; Si: 0.36. Crocidolite, Mg: 1.42; Si: 0.37.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Test Substance			
Metric 1:	Test Substance Identity	High	The test substance was identified by common name.
Metric 2:	Test Substance Purity	Medium	The test substance source was reported. The purity of the test substance were not reported but this is unlikely to influence the study results.
Domain 2: Test Design			

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Study Citation:	Gronow, J. R. (1987). The dissolution of asbestos fibres in water. Clay Minerals 22(1):21-35.
OECD Harmonized Template:	Hydrolysis
HERO ID:	5353542

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 3:	Study Controls	N/A	The metric is not applicable to this study type.
	Metric 4:	Test Substance Stability	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 6:	Testing Conditions	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 7:	Testing Consistency	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 8:	System Type and Design	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology addressed the outcome of interest.
	Metric 12:	Test Substance Purity	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

Overall Quality Determination High

Study Citation:	Thom, J. G. M., Dipple, G. M., Power, I., Harrison, A. L. (2013). Chrysotile dissolution rates: Implications for carbon sequestration. Applied Geochemistry 35:244-254.
OECD Harmonized Template:	Hydrolysis
HERO ID:	3584211

EXTRACTION

Parameter	**Data**
CASRN and Test Material	12001-29-5; Chrysotile
Confidentiality, Type, Guideline	None; Experimental; other: Steady-state dissolution rate study
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; Cassiar Mine, British Columbia, Canada; fiber; High-grade fibrous-matted ore; X-ray diffraction (XRD) analysis showed chrysotile, talc, magnetite, quartz, and clay minerals (palygorskite and sepiolite)
Buffer, Test Temperature, Number of Replicates	0.1 m NaCl solutions; 22°C; Not reported
Positive Controls and Negative Controls	Positive: Not applicable; Negative: Not applicable
pH and Duration	2 to 8; 187-659 hours
Sampling Frequency and Test Setup	'intermittently'; Continuously stirred flow-through reactor with the input solutions pre-equilibrated with atmospheric CO2
Concentration	1.0 - 1.5 g/L
Analytical Method, Analytical Details, and Statistics	Quantachrome-1A system using the N2 (gas)-BET method for surface area, Thermo Electron Corp. Orion 250A+ for pH, Mg using flame-AAS, total Si concentration using molybdate blue method.; Not Reported; Not Reported
Transformation Products	Mg and Si
Reference Substance and Reference Substance Results	Not applicable; Not applicable
Percent Recovery, Hydrolysis Rate Constant, and Half-life	Not applicable; Stoichiometric chrysotile flux: FMg=-0.22pH-10:02; Fsi=-0.19pH-10:37; Fchrysotile=-0.21pH-10.57 where FMg, FSi, and Fchrysotile are the log10 Mg, Si, and molar chrysotile fluxes in mol/m2/s,; Field weathering rates are 2.5 to 4.5 orders of magnitude slower than the rates reported here.
Results Remarks	During the progress of each experiment, solution acidity decreased and chrysotile dissolved, releasing Mg and Si into solution

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified definitively.
	Metric 2:	Test Substance Purity	High	The source or purity of the test substance was reported.
Domain 2: Test Design				
	Metric 3:	Study Controls	N/A	The study did not require concurrent control groups.
	Metric 4:	Test Substance Stability	High	The test substance stability, homogeneity, preparation, and storage conditions were reported.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	The test method was suitable for the test substance.
	Metric 6:	Testing Conditions	High	Testing conditions were monitored, reported, and appropriate for the method.

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Study Citation:	Thom, J. G. M., Dipple, G. M., Power, I., Harrison, A. L. (2013). Chrysotile dissolution rates: Implications for carbon sequestration. Applied Geochemistry 35:244-254.
OECD Harmonized Template:	Hydrolysis
HERO ID:	3584211

		EVALUATION		
Domain		Metric	Rating	Comments
	Metric 7:	Testing Consistency	High	Test conditions were consistent across samples or study groups. The conditions of the exposure were documented.
	Metric 8:	System Type and Design	High	Steady state was established.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology addressed or reported the intended outcome of interest.
	Metric 12:	Test Substance Purity	Medium	Minor limitations were identified in sampling methods of the outcome(s) of interest were reported; however, the limitations were not likely to have a substantial impact on results.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	High	Sources of variability and uncertainty in the measurements, and statistical techniques and between study groups (if applicable) were considered and accounted for in data evaluation.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	High	analytical methods used were suitable for detection and quantification of the target chemical and transformation product(s).
	Metric 16:	Statistical Methods and Kinetic Calculations	High	Statistical methods or kinetic calculations were clearly described and address the dataset.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	The study results were reasonable.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

Overall Quality Determination — High

Study Citation:	Walter, M., Schenkeveld, W. D. C., Reissner, M., Gille, L., Kraemer, S. M. (2019). The Effect of pH and Biogenic Ligands on the Weathering of Chrysotile Asbestos: The Pivotal Role of Tetrahedral Fe in Dissolution Kinetics and Radical Formation. Chemistry: A European Journal 25(13):3286-3300.
OECD Harmonized Template:	Hydrolysis
HERO ID:	6859826

EXTRACTION

Parameter	**Data**
CASRN and Test Material	12001-29-5; Chrysotile
Confidentiality, Type, Guideline	None; Experimental; other: Mg and Si dissolution from Chrysotile over the pH range 3.0-11.5
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; Shijiazhuang; NR; Fe impurities measured Notes: NR
Buffer, Test Temperature, Number of Replicates	50 mmol/L; 20±2°C; 2
Positive Controls and Negative Controls	Positive: Not applicable; Negative: Blank dissolution experiments (only buffer and electrolyte)
pH and Duration	3.0, 4.5, 6.0, 7.5, 8.5 and 11.5; 336 hours
Sampling Frequency and Test Setup	Not Reported; end-over-end shaker at 15 rpm in the dark
Concentration	1 g/L
Analytical Method, Analytical Details, and Statistics	Metal and Si concentrations analyzed by ICP-OES (Optima 5300-DV, PerkinElmer); Not applicable; Not Reported
Transformation Products	Mg and Si
Reference Substance and Reference Substance Results	Not applicable; Not applicable
Percent Recovery, Hydrolysis Rate Constant, and Half-life	Not applicable; Mg dissolution rates changed over time, the first stage of rapid dissolution (0.5-8 hour) and a second stage (24-336 hours) with slower dissolution; ND; all rates in Table S2 in the Supporting Information
Results Remarks	Mg=552, 585 and 448 umol/L at pH 3.0. 7.5 and 8.5 and 0.5, 336 and 336 hours, respectively.Si=11.6, 15.4 and 8.5 umol/Lat pH 3.0. 7.5 and 8.5 and 0.5, 336 and 336 hours, respectively.

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified definitively.
	Metric 2:	Test Substance Purity	High	The source or purity of the test substance was reported or the test substance identity and purity were verified by analytical means.
Domain 2: Test Design				
	Metric 3:	Study Controls	High	A concurrent negative control were included.
	Metric 4:	Test Substance Stability	High	The test substance stability, homogeneity, preparation, and storage conditions were reported.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	The test method was suitable for the test substance.
	Metric 6:	Testing Conditions	High	Testing conditions were monitored, reported, and appropriate for the method.

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Study Citation:	Walter, M., Schenkeveld, W. D. C., Reissner, M., Gille, L., Kraemer, S. M. (2019). The Effect of pH and Biogenic Ligands on the Weathering of Chrysotile Asbestos: The Pivotal Role of Tetrahedral Fe in Dissolution Kinetics and Radical Formation. Chemistry: A European Journal 25(13):3286-3300.
OECD Harmonized Template:	Hydrolysis
HERO ID:	6859826

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 7:	Testing Consistency	High	Test conditions were consistent across samples or study groups. The conditions of the exposure were documented.
	Metric 8:	System Type and Design	Medium	Some details were missing regarding the system type and design but the omissions were not likely to have a substantial impact on interpretation of the study results.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology addressed or reported the intended outcome(s) of interest.
	Metric 12:	Test Substance Purity	High	No notable uncertainties or limitations to the sampling were expected to influence results.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	High	Sources of variability and uncertainty in the measurements, and statistical techniques and between study groups (if applicable) were considered and accounted for in data evaluation.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	Some rates information is only available in the figures or supporting information.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	Statistical methods or kinetic calculations were clearly described and address the dataset.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	Reported values were within expected range as defined by reference substance.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

Overall Quality Determination — High

Study Citation:	NICNAS, (1999). Chrysotile asbestos: priority exisiting chemical no. 9.
OECD Harmonized Template:	Biodegradation in Water
HERO ID:	3978350

EXTRACTION

Parameter	**Data**
CASRN and Test Material	12001-29-5; Chrysotile Asbestos
Confidentiality, EndPoint, Type, Guideline	None; Other; Experimental; Not Reported: not specified
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; NR; NR; NR Notes: Molecular formula: Mg3Si2O5(OH)4
Blank and Control	NR; NR
Oxygen and Inoculum	NR; not specified
Duration, Parameter, System, and Sampling Frequency	NR; NR: NR; NR
pH Adjusted and pH	NR; NR
Concentration	NR NR - NR RN NR
Composition and Test Temperature	NR; NR
CEC, Water Aeration Dilution, Continuous Darkness, and Other Design	NR; NR; NR; Not Reported
Results Details Method, Results per Degradation Parameter, and Direct Quantum Yield Results	NR; NR; Not Reported
Results Value, Results Standard Deviation, Results Sample Time, and Results Reference Substance Compartments	NR; Not Reported; NR; Not Reported
Results Remarks and Results Details	Half-life in water > 200 days; Not Reported
Results Mean Total Recovery and Results per Recovery	Not Reported; Not Reported

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	Medium	The form of asbestos was not specified.
	Metric 2:	Test Substance Purity	Medium	The test substance source and purity were not reported in the secondary source.
Domain 2: Test Design				
	Metric 3:	Study Controls	Medium	Concurrent control group details were not reported in the secondary source.
	Metric 4:	Test Substance Stability	Medium	Test substance stability, homogeneity, preparation, and storage conditions were not reported in the secondary source.
Domain 3: Test Conditions				

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Study Citation:	NICNAS, (1999). Chrysotile asbestos: priority exisiting chemical no. 9.
OECD Harmonized Template:	Biodegradation in Water
HERO ID:	3978350

Domain		Metric	EVALUATION Rating	Comments
	Metric 5:	Test Method Suitability	Medium	Test method details were not reported in the secondary source however there is no indication that the methodology for producing the information was biased towards a particular outcome.
	Metric 6:	Testing Conditions	Medium	Testing conditions are unknown but are likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 7:	Testing Consistency	Medium	Testing consistency is unknown but are likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 8:	System Type and Design	N/A	Rating of this factor is not applicable to this kind of information.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	Rating of this factor is not applicable to this kind of information.
	Metric 10:	Sampling Methods	N/A	Rating of this factor is not applicable to this kind of information.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Medium	The outcome assessment methodology is unknown but is likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 12:	Test Substance Purity	Medium	Sampling methodology is unknown is unknown but is likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Medium	Sources of variability and uncertainty were not reported in the secondary source.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	Rating of this factor is not applicable to this kind of information.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	Limited data is reported in the secondary source but study data are likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	No statistical methods or kinetic calculations were reported in the secondary source.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Medium	The results are reasonable based on the data's inclusion in a peer- reviewed/recognized database or other secondary source.
	Metric 18:	QSAR Models	N/A	Rating of this factor is not applicable to this kind of information.

Overall Quality Determination Medium

* Related References: Cited University of Virginia (1996) Charlottesville, USA. Division of recoverable and disposal resources. gofer://ecosys.drdr.virginia.EDU:70:00/library/gen/toxics/Asbestos (accessed 1996).

Study Citation:	Belanger, S. E., Cherry, D. S., Cairns J, , J. R. (1986). Uptake of chrysotile asbestos fibers alters growth and reproduction of Asiatic clams. Canadian Journal of Fisheries and Aquatic Sciences 43(1):43-52.
OECD Harmonized Template:	Aquatic Bioconcentration
HERO ID:	3093600

EXTRACTION

Parameter	Data
CASRN and Test Material	1332-21-4; Asbestos
Confidentiality, Type, and Guideline	None; Experimental; other: Uptake monitoring of chrysotile over 96-h and 30-d periods by Asiatic clams (Corbicula sp.)
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; Commercial supplier; Grade 5 chrysotile mined ore; NR Notes: NR
Test Organism and Test Organism Details	Adult Corbicula (Asiatic clams); 12.05-17.0 mm shell length from New River, Virginia. 7-14d acclimation period, fed Chlamydomonas reinhardti. Selected due to ubiquity in major American rivers.
Lipid Content, Test Temperature, pH, and Depuration Time	Not reported; 96 h experiments: 19.7-20.5°C; 30-d experiments: 19.2-19.5°C; 96-h experiments: 6.97-7.58; 30-d experiments: 7.15-7.29; Not reported
Media Type, TOC, and Salinity	other; Not reported; Not reported
Dissolved Oxygen, Conductivity, and Hardness	96-h experiments: 8.1-8.6 mg/L; 96-h experiments: 116.6-127.8 uS/cm^2; 30-d: 109.8-131.2 uS/cm^2; 96-h experiments: 58.6-66.7 mg/L CaCO3; 67.0-100.0 mg/L as CaCO3
Exposure Route, Elimination, and Nominal Measurements	Exposure via asbestos contaminated water. Aquarium used a stir bar to keep asbestos fibers in suspension; Not reported; Measured
Test Type, Test Temperature, and Test Condition Comments	semi-static; 96 h experiments: 19.7-20.5°C; 30-d experiments: 19.2-19.5°C; 16h light, 8h darkness. In experiments with feeding, algae was added daily to aquaria for a final density of 10^6 cells/L.
Duration, Parameter, and Sampling Frequency	96 hours, 30 days; other; Asbestos intake measured at the end of the experiments (96h or 30d). Siphoning behavior observed at 0, 0.5, 1, 2, 4, 8, 24, 48, 72, and 96 hours.
Concentration	2.5x10^8 - 8.8x10^9 fibers/L
Analytical Method and Analytical Details	Fiber counting using transmission electron microscope (TEM); Number of fibers/mg of dry weight gill tissue and visceral tissue was measured by ashing at 500°C for 8 hours, resuspension in 6 M HCl, filtration and treated as a water sample for TEM analysis.;
Rate Constant and Results per Recovery	Not reported; Not reported
Statistics, Basis, and Calculation Basis	Kruskal-Wallis statistics (one way ANOVA) were used to determine if there was significant changes in growth and siphoning activity under different exposures; other; other
Results Value and Results Details	96-h, no food: no fibers detected. 96-h given food: not detected at 10^4 fibers/L, 69.1±17.1 fibers/mg whole body homogenate at 10^8 fibers/L. 30 day: 147.3±52.6 fibers/mg d.w. gill tissue, 903.7±122.9 fibers/mg d.w. visceral tissue.; N=6 for 96-h controls given no food, N=3 for all other experiments.
Metabolites, Reference, and Results Reference Substance	Not reported; Not reported; Not reported

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Test Substance			
Metric 1:	Test Substance Identity	High	The substance was identified by common name.
Metric 2:	Test Substance Purity	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 2: Test Design			
Metric 3:	Study Controls	High	Blank groups were used which contained no asbestos and validated the test results.

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Study Citation:	Belanger, S. E., Cherry, D. S., Cairns J, , J. R. (1986). Uptake of chrysotile asbestos fibers alters growth and reproduction of Asiatic clams. Canadian Journal of Fisheries and Aquatic Sciences 43(1):43-52.
OECD Harmonized Template:	Aquatic Bioconcentration
HERO ID:	3093600

EVALUATION

Domain	Metric		Rating	Comments
	Metric 4:	Test Substance Stability	High	The test substance preparation was reported and appropriate for the study.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	The test method was suitable for the purpose of the study.
	Metric 6:	Testing Conditions	High	Testing conditions were clearly reported and suitable for the study.
	Metric 7:	Testing Consistency	High	Test conditions were consistent across study groups.
	Metric 8:	System Type and Design	High	The system described was able to maintain substance concentrations.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	High	The test organism was described and appropriate for the study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology was described clearly and reported the desired outcome.
	Metric 12:	Test Substance Purity	Medium	Accumulation rates were not derived due to sampling being done only at the end of the trials; however, this limitation did not have a substantial impact on the results.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	High	No confounding variables were noted among study groups that would influence the outcome assessment.
	Metric 14:	Health Outcomes Unrelated to Exposure	High	Exposure to asbestos caused decreased siphoning activity in all organisms to some degree. However, no health effects unrelated to exposure were noted.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	The method for measuring asbestos fiber levels in the whole body homogenate, gill tissue, and visceral tissue were clearly described; however, no data was presented to demonstrate the accuracy of those methods. Considering that they were based on previously established methods in other literature, it is unlikely that this impacted the study results.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	Statistical analysis was described and included in the results.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	The reported values were reasonable.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

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Study Citation:	Belanger, S. E., Cherry, D. S., Cairns J, , J. R. (1986). Uptake of chrysotile asbestos fibers alters growth and reproduction of Asiatic clams. Canadian Journal of Fisheries and Aquatic Sciences 43(1):43-52.
OECD Harmonized Template:	Aquatic Bioconcentration
HERO ID:	3093600

EVALUATION

Domain	Metric	Rating	Comments
Overall Quality Determination		**High**	

Study Citation:	Belanger, S. E., Cherry, D. S., Cairns J, , J. R. (1986). Seasonal behavioral and growth changes of juvenile Corbicula-fluminea exposed to chrysotile asbestos. Water Research 20(10):1243-1250.
OECD Harmonized Template:	Aquatic Bioconcentration
HERO ID:	3093856

EXTRACTION

Parameter	Data
CASRN and Test Material	1332-21-4; Asbestos
Confidentiality, Type, and Guideline	None; Experimental; other: Measured uptake of chrysotile asbestos by Asiatic clams (Corbicula sp., collected in winter and summer) after 96-h and 30-d exposure period
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; NR; NR; NR Notes: 400 mg of lightly milled asbestos used to make a 0.060 mg/L chrysotile stock, sonicated for 500 mL for 2 h.
Test Organism and Test Organism Details	Juvenile Corbicula; 5.2-8.6 mm shell length. Taken from New River, VA. Acclimated at 20°C for 7 days. Summer collections taken in 17-23°C water, winter collections taken in 8-12°C.
Lipid Content, Test Temperature, pH, and Depuration Time	Not reported; Winter: 20.0-20.5°C; summer: 20.2-20.4°C; Winter: 7.38-7.71; summer: 6.85-7.23; Not reported
Media Type, TOC, and Salinity	Not reported; Not reported; Not reported
Dissolved Oxygen, Conductivity, and Hardness	Not reported; Winter: 147.0-157.0; summer: 153.0-158.0 uS cm^-2; Winter: 60.0-75.0; summer: 65.0-77.5 mg/L
Exposure Route, Elimination, and Nominal Measurements	4-L aquaria with magnetic stirrer keeping asbestos suspended.; Not reported; Measured (0, 10^4, 10^8 fibers/L)
Test Type, Test Temperature, and Test Condition Comments	semi-static; Winter: 20.0-20.5°C; summer: 20.2-20.4°C; Winter collection occurred at temperatures of 8-12 C. Winter collected clams were brought up to 20C over a 2 day period in the laboratory
Duration, Parameter, and Sampling Frequency	96 hours and 30 days; other; At end of experiments (96 h or 30 d)
Concentration	0 - 10^8 fibers/L
Analytical Method and Analytical Details	Transmission election microscope (TEM) grid counting; Gill/visceral tissue was rinsed with conc. HCl, dried at 90 C (48 h), and ashed at 500 C (8 h). Ash was resuspended in 6 M HCl, filtered through 0.2 um pore filter and carbon coated. 3 grids and 10-15 holes/grid were viewed at x20,000 using TEM.;
Rate Constant and Results per Recovery	Not reported; Not reported
Statistics, Basis, and Calculation Basis	Kruskal-Wallis statistics (one way ANOVA) were used to determine if there was significant changes in growth or siphoning activity under different exposures; other; other
Results Value and Results Details	(Fibers/mg dry weight tissue): Winter samples: Gills: 132.1±36.4; Viscera: 1055.1±235.9. Summer: Gill: 147.5±30.9; Viscera: 1127.4±190.2; Fibers were not detected in clams from blank and 10^4 fiber/L groups.
Metabolites, Reference, and Results Reference Substance	Not applicable; Not reported; Not reported

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The substance was identified by common name.
	Metric 2:	Test Substance Purity	Medium	Test substance purity was not stated but is not likely to impact the study results.
Domain 2: Test Design				
	Metric 3:	Study Controls	High	Blank groups were used and had no detectable levels of asbestos.

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Study Citation:	Belanger, S. E., Cherry, D. S., Cairns J, , J. R. (1986). Seasonal behavioral and growth changes of juvenile Corbicula-fluminea exposed to chrysotile asbestos. Water Research 20(10):1243-1250.
OECD Harmonized Template:	Aquatic Bioconcentration
HERO ID:	3093856

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 4:	Test Substance Stability	High	The test substance is stable under testing conditions.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 6:	Testing Conditions	High	Testing conditions were clearly reported and suitable for the study method.
	Metric 7:	Testing Consistency	High	Reported testing conditions were consistent across study groups.
	Metric 8:	System Type and Design	High	The system type and design were capable of maintaining test substance concentrations.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 12:	Test Substance Purity	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	High	There were no confounding differences among the study groups that influenced the outcomes.
	Metric 14:	Health Outcomes Unrelated to Exposure	High	No health outcomes unrelated to exposure were noted.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	High	The analytical method was suitable for detecting the test substance levels.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

Overall Quality Determination High

Study Citation:	Belanger, S. E., Cherry, D. S., Cairns, J. (1990). Functional and pathological impairment of japanese medaka (Oryzias latipes) by long-term asbestos exposure. Aquatic Toxicology 17(2):133-154.
OECD Harmonized Template:	Aquatic Bioconcentration
HERO ID:	3585046

EXTRACTION

Parameter	Data
CASRN and Test Material	1332-21-4; Asbestos
Confidentiality, Type, and Guideline	None; Experimental; other
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; commercial supplier; chrysotile - grade 5 milled ore; NR Notes: lightly milling 400 mg of chrysotile and sonicating 500 mL of 0.060 mg/L stock for 2 hours
Test Organism and Test Organism Details	Japanese Medaka (Oryzias latipes); 25-35 mm total length
Lipid Content, Test Temperature, pH, and Depuration Time	Not reported; 19.7±0.4 to 20.0±0.5°C; 8.02±0.05 to 8.33± 0.07; Not reported
Media Type, TOC, and Salinity	natural water: freshwater; Not reported; Not reported
Dissolved Oxygen, Conductivity, and Hardness	8.3±0.9 to 8.8±0.2 mg/L; Not reported; 62.9±2.9 to 71.2±4.1 mg/L as CaCO3
Exposure Route, Elimination, and Nominal Measurements	Fibers were added to the aquarium containing the test organisms or petri dishes for medaka eggs; Not reported; Not reported
Test Type, Test Temperature, and Test Condition Comments	semi-static; 19.7±0.4 to 20.0±0.5°C; Water was renewed on a weekly basis by siphoning the old test solution out of each chamber until 40% of the water remained. Fresh solutions were added gently so as to minimize the disturbance of young fish.
Duration, Parameter, and Sampling Frequency	13 weeks; other; at 28 days; 13 weeks
Concentration	5.1±2.8e6 - 7.6±8.1e10 fibers/L
Analytical Method and Analytical Details	Transmission electron microscope (TEM); The head and fins were cut from the body and the remaining tissue was ashed at 500°C for 8 hours. Ash was suspended in 6 M HCl, filtered with 0.2 pm pore polycarbonate filters and analyzed by TEM.;
Rate Constant and Results per Recovery	Not applicable; Not applicable
Statistics, Basis, and Calculation Basis	One Way Analysis of Variance (ANOVA) rank analogue Kruskal-Wallist Test was used to determine significant differences in egg hatch ability, egg survival, larval growth, reproduction, growth and egg time to hatch between exposed and control groups; other; other
Results Value and Results Details	After 28 days of exposure to chrysotile asbestos at 1010 fibers/L concentrations, fish total body burden was 375.7 fibers/mg.; After 3 months of exposure to chrysotile asbestos at 108 fibers/L concentrations, fish total body burden was 486.4±47.9 fibers/mg.
Metabolites, Reference, and Results Reference Substance	Not reported; unexposed fish; No fibers were identified in control or blank samples (three grids and 5 to 10 gird holes per grid (a total of 15 to 30 holes).

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Test Substance			
	Metric 1: Test Substance Identity	High	The substance was identified using common name.
	Metric 2: Test Substance Purity	Medium	The purity of the original ore was not provided; but not likely to impact study results.
Domain 2: Test Design			
	Metric 3: Study Controls	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 4: Test Substance Stability	High	This metric met the criteria for high confidence as expected for this type of study.

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Study Citation:	Belanger, S. E., Cherry, D. S., Cairns, J. (1990). Functional and pathological impairment of japanese medaka (Oryzias latipes) by long-term asbestos exposure. Aquatic Toxicology 17(2):133-154.
OECD Harmonized Template:	Aquatic Bioconcentration
HERO ID:	3585046

			EVALUATION	
Domain		Metric	Rating	Comments
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 6:	Testing Conditions	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 7:	Testing Consistency	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 8:	System Type and Design	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	High	The test organism was described and was suitable for the study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 12:	Test Substance Purity	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	High	There were no confounding differences among study groups that influenced the outcome assessment.
	Metric 14:	Health Outcomes Unrelated to Exposure	High	There were no differences in health outcomes between groups unrelated to exposure.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	Calculations were described clearly and assumptions used in their interpretation were also stated.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

Overall Quality Determination High

Study Citation:	Belanger, S. E., Cherry, D. S., Cairns, J., Mcguire, M. J. (1987). Using Asiatic clams as a biomonitor for chrysotile asbestos in public water supplies. Journal of the American Water Works Association 79(3):69-74.
OECD Harmonized Template:	Aquatic Bioconcentration
HERO ID:	3584230

EXTRACTION

Parameter	Data
CASRN and Test Material	1332-21-4; Asbestos
Confidentiality, Type, and Guideline	None; Experimental; other: Asbestos concentrations in clams and water from a contaminated lake were measured and used to calculate BCF values. A 30-d laboratory exposure was also used to determine BCF values.
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; NR; NR; NR Notes: 400 mg of lightly milled asbestos used to make a 0.060 mg/L chrysotile stock, sonicated for 500 mL for 2 h.
Test Organism and Test Organism Details	Asiatic clam (corbicula sp.); Field collections taken from the California State Water Project at Lake Silverwood, Calif at 148 ft depth; 0.68-1.00 inch shell lengths. Lab exposed clams taken from New River, VA at 3.3-4.9 ft.
Lipid Content, Test Temperature, pH, and Depuration Time	Not reported; Not reported; Not reported; Not reported
Media Type, TOC, and Salinity	Not reported; Not reported; Not reported
Dissolved Oxygen, Conductivity, and Hardness	Not reported; Not reported; Not reported
Exposure Route, Elimination, and Nominal Measurements	Aqueous and sediment; Not reported; Measured (for 30 days exposures: 0, 10^4 and 10^8 fibers/L were done)
Test Type, Test Temperature, and Test Condition Comments	semi-static; Not reported; Clams were kept in 15-L jars containing stir bars to keep fibers in suspension.
Duration, Parameter, and Sampling Frequency	30 days; other; Once (at the end of the field or laboratory exposures)
Concentration	0 - 10^8 fibers/L
Analytical Method and Analytical Details	Transmission Electron Microscope analysis used to determine concentrations in gill tissue, visceral tissue, and whole body homogenate.; Tissue was ashed at 500°C for 8-h. Ash was resuspended in 6 M HCl and treated as a water sample for TEM analysis.;
Rate Constant and Results per Recovery	BCF; Not reported
Statistics, Basis, and Calculation Basis	Fiber concentration and size distribution in tissue and BCF data were compared for lab and field data using the one-way analysis of variance (ANOVA) rank-analog, the Kruskal-Wallis Test; other (gill, viscera and whole clam); other
Results Value and Results Details	BCF (30-d at 10^8 fibers/L): 0.308 in gill tissue, 1.89 in viscera tissue, and 1.91 in whole clam homogenates. Field exposed BCFs: 0.16-0.19 in gills, 64.9-102 in viscera, 1442-5222 in whole clams.; 30-d BCF values were used in calculating the field-exposed BCFs, working under the following assumptions: that asbestos is not depurated after intake and that clam age does not influence intake rate.
Metabolites, Reference, and Results Reference Substance	Not reported; Not reported; Not reported

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Test Substance			
Metric 1:	Test Substance Identity	High	The substance was identified by common name.
Metric 2:	Test Substance Purity	High	The purity of the original ore was not provided; however, the authors noted that fibers were only identified as chrysotile if the characteristic TEM transmission patterns were seen and were considered ”non-chrysotile fibers” if not.
Domain 2: Test Design			

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Study Citation:	Belanger, S. E., Cherry, D. S., Cairns, J., Mcguire, M. J. (1987). Using Asiatic clams as a biomonitor for chrysotile asbestos in public water supplies. Journal of the American Water Works Association 79(3):69-74.
OECD Harmonized Template:	Aquatic Bioconcentration
HERO ID:	3584230

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 3:	Study Controls	High	Blank groups were included in the laboratory exposure experiments and did not have detectable levels of asbestos.
	Metric 4:	Test Substance Stability	High	The test substance is stable under the test conditions.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	The test method was suitable for the test substance.
	Metric 6:	Testing Conditions	Medium	Some testing conditions were omitted such as temperature and pH ranges but these omission are not likely to have a substantial impact on the results.
	Metric 7:	Testing Consistency	High	There were no noted inconsistencies between the study groups.
	Metric 8:	System Type and Design	High	The system was capable of maintaining the concentration of the test substance.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	High	The test organism was described and was suitable for the study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology addressed the outcomes of interest.
	Metric 12:	Test Substance Purity	High	The sampling methods were adequate for the purpose of the study.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	High	There were no confounding differences among study groups that influenced the outcome assessment. Also, uncertainty was provided in the concentration measurements for both the field and laboratory experiments.
	Metric 14:	Health Outcomes Unrelated to Exposure	High	There were no differences in health outcomes between groups unrelated to exposure.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	No standard reference material was analyzed in order to test the accuracy of the analysis method; however, this omission was not likely to have had a substantial impact on the results.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	Calculations were described clearly and assumptions used in their interpretation were also stated.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	The study results were compared to similar experiments done with other test organisms and were reasonable in comparison.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

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Study Citation:	Belanger, S. E., Cherry, D. S., Cairns, J., Mcguire, M. J. (1987). Using Asiatic clams as a biomonitor for chrysotile asbestos in public water supplies. Journal of the American Water Works Association 79(3):69-74.
OECD Harmonized Template:	Aquatic Bioconcentration
HERO ID:	3584230

EVALUATION

Domain	Metric	Rating	Comments
Overall Quality Determination		**High**	

Study Citation:	Belanger, S. E., Schurr, K., Allen, D. J., Gohara, A. F. (1986). Effects of chrysotile asbestos on coho salmon and green sunfish: evidence of behavioral and pathological stress. Environmental Research 39(1):74-85.
OECD Harmonized Template:	Aquatic Bioconcentration
HERO ID:	3584231

EXTRACTION

Parameter	Data
CASRN and Test Material	1332-21-4; Asbestos
Confidentiality, Type, and Guideline	None; Experimental; other: accumulation
Solvent, Reactivity, Storage, Stability	Water; NR; NR; NR
Radiolabel, Source, State, Purity	No; NR; NR; NR Notes: milled. Fiber concentrations and identifications documented elsewhere.
Test Organism and Test Organism Details	Coho salmon (Oncorhynchus kisutch) and juvenile greensunfish (Lepomis cyanellus).; Coho salmon eggs were obtained and raised in self-circulating, closed system, 18-liter tanks at 9.0±1.0°C. Mixed sex populations of juvenile green sunfish acclimated at 20±2.0°C for 5 days.
Lipid Content, Test Temperature, pH, and Depuration Time	Not reported; 9.0 ±1.0°C; Not reported; Not reported
Media Type, TOC, and Salinity	natural water: freshwater; Not reported; Not reported
Dissolved Oxygen, Conductivity, and Hardness	Not reported; Not reported; Not reported
Exposure Route, Elimination, and Nominal Measurements	Not reported; Not reported; Not Reported
Test Type, Test Temperature, and Test Condition Comments	static; 9.0 ±1.0°C; Coho treated with 1.5e6 fibers/liter for 86 days from hatching; coho treated with 3.0e6 fibers/liter for 40 days after 26 days post hatching. Sunfish exposed for 67 days at 1.5e6 fibers/liter and 52 days at 3.0 fibers/liter.
Duration, Parameter, and Sampling Frequency	135 days (coho); 67 days (sunfish); other; end of experiment
Concentration	1.5e6 - 3.0e6 other
Analytical Method and Analytical Details	Transmission electron microscopy (TEM).; Whole fish were ashed at 200°C for 16-18 hr. The ash residue was resuspended in 6 M HC1 and filtered through a 0.2-um pore Nucleoporefilter. Small sections of the filter were carbon-coated, inverted, and placed on a Formvar-coated 200-mesh TEM grid.;
Rate Constant and Results per Recovery	Not reported; Not reported
Statistics, Basis, and Calculation Basis	Coho larvae exposed to asbestos fibers were significantly more susceptible to anesthetic stress as compared to control as indicated by the student t-test. Average total lengths of fish exposed to asbestos and controls were not statistically different; other; other
Results Value and Results Details	TEM preparations confirmed the presence of asbestos fibers in asbestos-treated fish.; Total body burdens were not calculated. Sunfish lost scales and had epidermal tissue erosion.
Metabolites, Reference, and Results Reference Substance	Not reported; unexposed fish; Asbestos fibers were not identified in control or blank samples.

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The substance was identified by common name.
	Metric 2:	Test Substance Purity	Medium	Purity and source of test substance not provided; however, it is not likely to effect the results of this study.
Domain 2: Test Design				
	Metric 3:	Study Controls	High	This metric met the criteria for high confidence as expected for this type of study.

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Study Citation:	Belanger, S. E., Schurr, K., Allen, D. J., Gohara, A. F. (1986). Effects of chrysotile asbestos on coho salmon and green sunfish: evidence of behavioral and pathological stress. Environmental Research 39(1):74-85.
OECD Harmonized Template:	Aquatic Bioconcentration
HERO ID:	3584231

		EVALUATION		
Domain	Metric		Rating	Comments
	Metric 4:	Test Substance Stability	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 6:	Testing Conditions	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 7:	Testing Consistency	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 8:	System Type and Design	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	High	The metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 12:	Test Substance Purity	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	High	Confounding variables were appropriately addressed.
	Metric 14:	Health Outcomes Unrelated to Exposure	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	High	Data reporting was appropriate for this study.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

Overall Quality Determination High

Study Citation:	Davenport, M. S. (1993). Water-Quality and Biological Data for Selected Streams, Lakes, and Wells in the High Point Lake Watershed, Guilford County, North Carolina, 1988-89.
OECD Harmonized Template:	Adsorption and Desorption
HERO ID:	6882558

EXTRACTION

Parameter	Data
CASRN and Test Material	1332-21-4; Asbestos
Confidentiality, Type, Guideline	No; Monitoring study; other: Non-guidleline monitoring study of waters and sediments
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; Water samples collected from Oak Hollow and High Point lakes; NR; Analytical standard not reported Notes: R
Sampling Frequency, Sampling Details, and Number of Replicates	Sampling conducted in June (watres) and August (sediments) 1989; Water samples collected from Oak Hollow and High Point lake watershed North Carolina were analyzed from total asbestos. Chemical analyses of lake sediments and particle-size analyses of lake sediments were performed once; bottom sediment collected at 8 lake sites using stainless steel equipment and stainless steel Ponar Grab Dredge sampler.; Sampling locations: 8 lake sites (four lake samples were collected).
pH, Test Temperature, Buffer, and Test Details	not reported; not reported; not reported; not reported
Matrix, Clay Silts and Organic Carbon, and CEC	other; not reported; not reported
Bulk Density and Matrix Details	not reported; not reported
Media, Recovery, and Statistics	not reported; not reported; not reported
Transformation Products, Equilibrium Adsorption Details, and Equilibrium Desorption Details	not reported; not reported; not reported
Reference Substance, Reference Substance Results, and Percent Adsorption	not reported; not reported; not reported
Adsorption Coefficient Type, Adsorption Coefficient Results, Adsorption Coefficient Results Comments, and Adsorption Desorption Type	not reported; not reported; June 1989: Site G and H <1 FIB/100 mL; (sampling depths Site G 10.0 and Site H 12.0 feet); no results reported for total asbestos in sediment samples.; not reported
Partition Coefficient Type and Partition Coefficient Results	not reported; not reported
Partition Coefficient Phase and Partition Coefficient Results	not reported; not reported
Mass Balance	not reported

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Test Substance			
Metric 1:	Test Substance Identity	High	The test substance was identified.
Metric 2:	Test Substance Purity	N/A	This metric is not applicable to this study.
Domain 2: Test Design			
Metric 3:	Study Controls	N/A	This metric is not applicable to this study.
Metric 4:	Test Substance Stability	N/A	This metric is not applicable to this study.

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Study Citation:	Davenport, M. S. (1993). Water-Quality and Biological Data for Selected Streams, Lakes, and Wells in the High Point Lake Watershed, Guilford County, North Carolina, 1988-89.
OECD Harmonized Template:	Adsorption and Desorption
HERO ID:	6882558

		EVALUATION	
Domain	Metric	Rating	Comments
Domain 3: Test Conditions			
Metric 5:	Test Method Suitability	N/A	This metric is not applicable to this study.
Metric 6:	Testing Conditions	N/A	This metric is not applicable to this study.
Metric 7:	Testing Consistency	N/A	This metric is not applicable to this study.
Metric 8:	System Type and Design	High	Equilibrium assumed in field studies.
Domain 4: Test Organisms			
Metric 9:	Outcome Assessment Methodology	N/A	This metric is not applicable to this study.
Metric 10:	Sampling Methods	N/A	This metric is not applicable to this study.
Domain 5: Outcome Assessment			
Metric 11:	Test Substance Identity	Uninformative	Results for one media reported.
Metric 12:	Test Substance Purity	Low	Limited detail regarding this metric.
Domain 6: Confounding/Variable Control			
Metric 13:	Confounding Variables	N/A	This metric is not applicable to this study.
Metric 14:	Health Outcomes Unrelated to Exposure	N/A	This metric is not applicable to this study.
Domain 7: Data Presentation and Analysis			
Metric 15:	Data Reporting	Uninformative	Intended outcome of interest not reported.
Metric 16:	Statistical Methods and Kinetic Calculations	N/A	This metric is not applicable to this study.
Domain 8: Other			
Metric 17:	Verification or Plausibility of Results	Uninformative	Intended outcome of interest not reported.
Metric 18:	QSAR Models	N/A	This metric is not applicable to this study.

Overall Quality Determination — Uninformative

Study Citation:	(2017). PubChem: Chrysotile.
OECD Harmonized Template:	Adsorption and Desorption
HERO ID:	3860485

EXTRACTION

Parameter	Data
CASRN and Test Material	Not Reported; chrysotile
Confidentiality, Type, Guideline	None; Experimental; other: Not reported
Solvent, Reactivity, Storage, Stability	Distilled water; Not reported; Not reported; Not reported
Radiolabel, Source, State, Purity	Not reported; Not reported; Not reported; Not reported Notes: Not reported
Sampling Frequency, Sampling Details, and Number of Replicates	Not reported; Not reported; Not reported
pH, Test Temperature, Buffer, and Test Details	Not reported; 37 deg C; Not reported; Chemical equilibrium not reached after 2 months
Matrix, Clay Silts and Organic Carbon, and CEC	other; Not reported; Not reported
Bulk Density and Matrix Details	Not reported; Asbestos
Media, Recovery, and Statistics	Water; Not reported; Not reported
Transformation Products, Equilibrium	Not reported; Not reported; 1,000 umol of Mg/g asbestos leached after 2 months
Adsorption Details, and Equilibrium Desorption Details	
Reference Substance, Reference Substance Results, and Percent Adsorption	Not reported; Not reported; Not reported
Adsorption Coefficient Type, Adsorption Coefficient Results, Adsorption Coefficient Results Comments, and Adsorption	Not reported; Not reported; Not reported; Not reported
Desorption Type	
Partition Coefficient Type and Partition Coefficient Results	Not reported; Not reported
Partition Coefficient Phase and Partition Coefficient Results	Not reported; After the magnesium had leached out, the silica skeleton began flaking apart, thereby eliminating the asbestos structure
Mass Balance	Not reported

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Test Substance			
Metric 1:	Test Substance Identity	High	The test substance was identified by name.
Metric 2:	Test Substance Purity	Medium	Not reported in this secondary source; the primary source likely contains more detail.
Domain 2: Test Design			
Metric 3:	Study Controls	Medium	Not reported in this secondary source; the primary source likely contains more detail.
Metric 4:	Test Substance Stability	Medium	Not reported in this secondary source; the primary source likely contains more detail.
Domain 3: Test Conditions			
Metric 5:	Test Method Suitability	Medium	Not reported in this secondary source; the primary source likely contains more detail.

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Study Citation:	(2017). PubChem: Chrysotile.
OECD Harmonized Template:	Adsorption and Desorption
HERO ID:	3860485

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 6:	Testing Conditions	Medium	Not reported in this secondary source; the primary source likely contains more detail.
	Metric 7:	Testing Consistency	Medium	Not reported in this secondary source; the primary source likely contains more detail.
	Metric 8:	System Type and Design	Medium	Not reported in this secondary source; the primary source likely contains more detail.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Medium	There was incomplete reporting of outcome assessment methods however, the primary source likely contains more detail.
	Metric 12:	Test Substance Purity	Medium	Not reported in this secondary source; the primary source likely contains more detail.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Medium	Not reported in this secondary source; the primary source likely contains more detail.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	The target chemical and transformation product(s) concentrations, extraction efficiency, percent recovery, or mass balance were not reported; however, these omissions were not likely to have a substantial impact on study results and the primary source likely contains more detail.
	Metric 16:	Statistical Methods and Kinetic Calculations	Medium	Not reported in this secondary source; the primary source likely contains more detail.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	The results are reasonable based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

Overall Quality Determination Medium

* Related References: Cited Callahan, M.A., Slimak, M.W., Gabel, N.W. et al. 1979. Water-Related Environmental Fate of 129 Priority Pollutants. Volume I. EPA-440/4-79-029a. Washington, DC: U.S. Environmental Protection Agency, p. 7-8. Which cites Chowdhury, S. (1975). "Kinetics of leaching of asbestos minerals at body temperature." Journal of Applied Chemistry and Biotechnology 25(5): 347-353. HERO ID 6914826.

Study Citation:	ATSDR, (2001). Toxicological profile for asbestos (Update, September 2001).
OECD Harmonized Template:	Miscellaneous
HERO ID:	786664

EXTRACTION

Parameter	**Data**
CASRN and Test Material	1332-21-4; Not Reported
Confidentiality, Type, Guideline	None; Air transport; Air transport
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; NR; NR; NR Notes: NR
Test Method Details, Test Condition Details, and Test Consistency Details	NR; NR; NR
System Type Design	NR
Sampling Frequency and Sampling Details	NR; NR
Test Temperature	NR
Results Details	Asbestos fibers of 0.1 to 1 um aerodynamic diameters can be transported thousands of miles in air.
Analytical Method and Analytical Details	NR; NR
Transformation Products, Statistics, and Kinetics	NR; NR; NR
Reference Substance and Reference Substance Results	NR; NR

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified by name.
	Metric 2:	Test Substance Purity	Medium	The test substance source and purity were not reported in the secondary source.
Domain 2: Test Design				
	Metric 3:	Study Controls	Medium	Concurrent control group details were not reported in the secondary source.
	Metric 4:	Test Substance Stability	Medium	Test substance stability, homogeneity, preparation, and storage conditions were not reported in the secondary source.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	Medium	Test method details were not reported in the secondary source however there is no indication that the methodology for producing the information was biased towards a particular outcome.
	Metric 6:	Testing Conditions	Medium	Testing conditions are unknown but are likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 7:	Testing Consistency	Medium	Testing consistency is unknown but are likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.

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Study Citation:	ATSDR, (2001). Toxicological profile for asbestos (Update, September 2001).
OECD Harmonized Template:	Miscellaneous
HERO ID:	786664

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 8:	System Type and Design	N/A	Rating of this factor is not applicable to this kind of information.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	Rating of this factor is not applicable to this kind of information.
	Metric 10:	Sampling Methods	N/A	Rating of this factor is not applicable to this kind of information.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Medium	The outcome assessment methodology is unknown but is likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 12:	Test Substance Purity	Medium	Sampling methodology is unknown is unknown but is likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Medium	Sources of variability and uncertainty were not reported in the secondary source.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	Rating of this factor is not applicable to this kind of information.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	Limited data is reported in the secondary source but study data are likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	No statistical methods or kinetic calculations were reported in the secondary source.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Medium	The results are reasonable based on the data's inclusion in a peer- reviewed/recognized database or other secondary source.
	Metric 18:	QSAR Models	N/A	Rating of this factor is not applicable to this kind of information.

Overall Quality Determination Medium

* Related References: Cites HEROID 78037 (Jaenicke R. 1980. Natural aerosols. Ann NY Acad Sci 338:317-325.), not currently extracted.

Study Citation:	ATSDR, (2001). Toxicological profile for asbestos (Update, September 2001).
OECD Harmonized Template:	Miscellaneous
HERO ID:	786664

EXTRACTION

Parameter	**Data**
CASRN and Test Material	1332-21-4; Not Reported
Confidentiality, Type, Guideline	None; Water transport; Water transport
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; NR; NR; NR Notes: NR
Test Method Details, Test Condition Details, and Test Consistency Details	NR; NR; NR
System Type Design	NR
Sampling Frequency and Sampling Details	NR; NR
Test Temperature	NR
Results Details	Asbestos fibers were transported over 75 miles in Lake Superior water.
Analytical Method and Analytical Details	NR; NR
Transformation Products, Statistics, and Kinetics	NR; NR; NR
Reference Substance and Reference Substance Results	NR; NR

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified by name.
	Metric 2:	Test Substance Purity	Medium	The test substance source and purity were not reported in the secondary source.
Domain 2: Test Design				
	Metric 3:	Study Controls	Medium	Concurrent control group details were not reported in the secondary source.
	Metric 4:	Test Substance Stability	Medium	Test substance stability, homogeneity, preparation, and storage conditions were not reported in the secondary source.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	Medium	Test method details were not reported in the secondary source however there is no indication that the methodology for producing the information was biased towards a particular outcome.
	Metric 6:	Testing Conditions	Medium	Testing conditions are unknown but are likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 7:	Testing Consistency	Medium	Testing consistency is unknown but are likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 8:	System Type and Design	N/A	Rating of this factor is not applicable to this kind of information.
Domain 4: Test Organisms				

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Study Citation:	ATSDR, (2001). Toxicological profile for asbestos (Update, September 2001).
OECD Harmonized Template:	Miscellaneous
HERO ID:	786664

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 9:	Outcome Assessment Methodology	N/A	Rating of this factor is not applicable to this kind of information.
	Metric 10:	Sampling Methods	N/A	Rating of this factor is not applicable to this kind of information.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Medium	The outcome assessment methodology is unknown but is likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 12:	Test Substance Purity	Medium	Sampling methodology is unknown is unknown but is likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Medium	Sources of variability and uncertainty were not reported in the secondary source.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	Rating of this factor is not applicable to this kind of information.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	Limited data is reported in the secondary source but study data are likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	No statistical methods or kinetic calculations were reported in the secondary source.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Medium	The results are reasonable based on the data's inclusion in a peer- reviewed/recognized database or other secondary source.
	Metric 18:	QSAR Models	N/A	Rating of this factor is not applicable to this kind of information.

Overall Quality Determination Medium

* Related References: Cites HEROID 69443 (EPA. 1979c. Water-related environmental fate of 129 priority pollutants. Vol I. Introduction and technical background, metals and inorganics, pesticides and PCBs. Washington, DC: U.S. Environmental Protection Agency, Office of Water Planning and Standards. EPA-440/4-79-029a. NTIS No. PB80-204373.), not currently extracted.

Study Citation:	ATSDR, (2001). Toxicological profile for asbestos (Update, September 2001).
OECD Harmonized Template:	Miscellaneous
HERO ID:	786664

EXTRACTION

Parameter	**Data**
CASRN and Test Material	1332-21-4; Not Reported
Confidentiality, Type, Guideline	None; Water transport; Water transport
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; NR; NR; NR Notes: NR
Test Method Details, Test Condition Details, and Test Consistency Details	NR; NR; NR
System Type Design	NR
Sampling Frequency and Sampling Details	NR; NR
Test Temperature	NR
Results Details	Asbestos fibers may interact with organic matter in the water and coagulate and precipitate out.
Analytical Method and Analytical Details	NR; NR
Transformation Products, Statistics, and Kinetics	NR; NR; NR
Reference Substance and Reference Substance Results	NR; NR

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified by name.
	Metric 2:	Test Substance Purity	Medium	The test substance source and purity were not reported in the secondary source.
Domain 2: Test Design				
	Metric 3:	Study Controls	Medium	Concurrent control group details were not reported in the secondary source.
	Metric 4:	Test Substance Stability	Medium	Test substance stability, homogeneity, preparation, and storage conditions were not reported in the secondary source.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	Medium	Test method details were not reported in the secondary source however there is no indication that the methodology for producing the information was biased towards a particular outcome.
	Metric 6:	Testing Conditions	Medium	Testing conditions are unknown but are likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 7:	Testing Consistency	Medium	Testing consistency is unknown but are likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 8:	System Type and Design	N/A	Rating of this factor is not applicable to this kind of information.
Domain 4: Test Organisms				

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Study Citation:	ATSDR, (2001). Toxicological profile for asbestos (Update, September 2001).
OECD Harmonized Template:	Miscellaneous
HERO ID:	786664

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 9:	Outcome Assessment Methodology	N/A	Rating of this factor is not applicable to this kind of information.
	Metric 10:	Sampling Methods	N/A	Rating of this factor is not applicable to this kind of information.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Medium	The outcome assessment methodology is unknown but is likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 12:	Test Substance Purity	Medium	Sampling methodology is unknown is unknown but is likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Medium	Sources of variability and uncertainty were not reported in the secondary source.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	Rating of this factor is not applicable to this kind of information.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	Limited data is reported in the secondary source but study data are likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	No statistical methods or kinetic calculations were reported in the secondary source.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Medium	The results are reasonable based on the data's inclusion in a peer- reviewed/recognized database or other secondary source.
	Metric 18:	QSAR Models	N/A	Rating of this factor is not applicable to this kind of information.

Overall Quality Determination Medium

* Related References: Cites HEROID 69443 (EPA. 1979c. Water-related environmental fate of 129 priority pollutants. Vol I. Introduction and technical background, metals and inorganics, pesticides and PCBs. Washington, DC: U.S. Environmental Protection Agency, Office of Water Planning and Standards. EPA-440/4-79-029a. NTIS No. PB80-204373.), not currently extracted.

Study Citation:	ATSDR, (2001). Toxicological profile for asbestos (Update, September 2001).
OECD Harmonized Template:	Miscellaneous
HERO ID:	786664

EXTRACTION

Parameter	**Data**
CASRN and Test Material	1332-21-4; Not Reported
Confidentiality, Type, Guideline	None; Water fate; Water fate
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; NR; NR; NR Notes: NR
Test Method Details, Test Condition Details, and Test Consistency Details	NR; NR; NR
System Type Design	NR
Sampling Frequency and Sampling Details	NR; NR
Test Temperature	NR
Results Details	Asbestos fibers are expected to persist in the environment for very long periods of time, unchanged.
Analytical Method and Analytical Details	NR; NR
Transformation Products, Statistics, and Kinetics	NR; NR; NR
Reference Substance and Reference Substance Results	NR; NR

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified by name.
	Metric 2:	Test Substance Purity	Medium	The test substance source and purity were not reported in the secondary source.
Domain 2: Test Design				
	Metric 3:	Study Controls	Medium	Concurrent control group details were not reported in the secondary source.
	Metric 4:	Test Substance Stability	Medium	Test substance stability, homogeneity, preparation, and storage conditions were not reported in the secondary source.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	Medium	Test method details were not reported in the secondary source however there is no indication that the methodology for producing the information was biased towards a particular outcome.
	Metric 6:	Testing Conditions	Medium	Testing conditions are unknown but are likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 7:	Testing Consistency	Medium	Testing consistency is unknown but are likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 8:	System Type and Design	N/A	Rating of this factor is not applicable to this kind of information.
Domain 4: Test Organisms				

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Study Citation:	ATSDR, (2001). Toxicological profile for asbestos (Update, September 2001).
OECD Harmonized Template:	Miscellaneous
HERO ID:	786664

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 9:	Outcome Assessment Methodology	N/A	Rating of this factor is not applicable to this kind of information.
	Metric 10:	Sampling Methods	N/A	Rating of this factor is not applicable to this kind of information.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Medium	The outcome assessment methodology is unknown but is likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 12:	Test Substance Purity	Medium	Sampling methodology is unknown is unknown but is likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Medium	Sources of variability and uncertainty were not reported in the secondary source.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	Rating of this factor is not applicable to this kind of information.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	Limited data is reported in the secondary source but study data are likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	No statistical methods or kinetic calculations were reported in the secondary source.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Medium	The results are reasonable based on the data's inclusion in a peer- reviewed/recognized database or other secondary source.
	Metric 18:	QSAR Models	N/A	Rating of this factor is not applicable to this kind of information.

Overall Quality Determination — Medium

* Related References: Cites EPA. 1989f. U.S. Environmental Protection Agency. Federal Register 54:29460-29513, not currently in HERO.

Study Citation:	ATSDR, (2001). Toxicological profile for asbestos (Update, September 2001).
OECD Harmonized Template:	Miscellaneous
HERO ID:	786664

EXTRACTION

Parameter	**Data**
CASRN and Test Material	1332-21-4; Not Reported
Confidentiality, Type, Guideline	None; Water fate; Water fate
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; NR; NR; NR Notes: NR
Test Method Details, Test Condition Details, and Test Consistency Details	NR; NR; NR
System Type Design	NR
Sampling Frequency and Sampling Details	NR; NR
Test Temperature	NR
Results Details	The half-life of asbestos fibers in aquatic environments is unknown but is estimated to be quite long.
Analytical Method and Analytical Details	NR; NR
Transformation Products, Statistics, and Kinetics	NR; NR; NR
Reference Substance and Reference Substance Results	NR; NR

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified by name.
	Metric 2:	Test Substance Purity	Medium	The test substance source and purity were not reported in the secondary source.
Domain 2: Test Design				
	Metric 3:	Study Controls	Medium	Concurrent control group details were not reported in the secondary source.
	Metric 4:	Test Substance Stability	Medium	Test substance stability, homogeneity, preparation, and storage conditions were not reported in the secondary source.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	Medium	Test method details were not reported in the secondary source however there is no indication that the methodology for producing the information was biased towards a particular outcome.
	Metric 6:	Testing Conditions	Medium	Testing conditions are unknown but are likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 7:	Testing Consistency	Medium	Testing consistency is unknown but are likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 8:	System Type and Design	N/A	Rating of this factor is not applicable to this kind of information.
Domain 4: Test Organisms				

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Study Citation:	ATSDR, (2001). Toxicological profile for asbestos (Update, September 2001).
OECD Harmonized Template:	Miscellaneous
HERO ID:	786664

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 9:	Outcome Assessment Methodology	N/A	Rating of this factor is not applicable to this kind of information.
	Metric 10:	Sampling Methods	N/A	Rating of this factor is not applicable to this kind of information.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Medium	The outcome assessment methodology is unknown but is likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 12:	Test Substance Purity	Medium	Sampling methodology is unknown is unknown but is likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Medium	Sources of variability and uncertainty were not reported in the secondary source.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	Rating of this factor is not applicable to this kind of information.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	Limited data is reported in the secondary source but study data are likely to be appropriate based on the data's inclusion in a peer-reviewed/recognized database or other secondary source.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	No statistical methods or kinetic calculations were reported in the secondary source.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Medium	The results are reasonable based on the data's inclusion in a peer- reviewed/recognized database or other secondary source.
	Metric 18:	QSAR Models	N/A	Rating of this factor is not applicable to this kind of information.

Overall Quality Determination Medium

* Related References: Cites HEROID 29585 (NRC. 1984. National Research Council. Asbestiform fibers: Nonoccupational health risks. Washington, DC: National Academy Press.), not currently extracted.

Study Citation:	Avataneo, C., Belluso, E., Capella, S., Cocca, D., Lasagna, M., Pigozzi, G., De Luca, D. A. (2021). GROUNDWATER ASBESTOS POLLUTION FROM NATURALLY OCCURRING ASBESTOS (NOA): A PRELIMINARY STUDY ON THE LANZO VALLEYS AND BALANGERO PLAIN AREA, NW ITALY. (Special Issue):5-9.
OECD Harmonized Template:	Miscellaneous
HERO ID:	10190487

EXTRACTION

Parameter	Data
CASRN and Test Material	12135-86-3; chrysotile/asbestiform antigorite
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	Ground water and surface water; NA; 4 deg C; NR
Radiolabel, Source, State, Purity	NA; natural rock formations containing asbestos; NA; Asbestiform - Asbestos, the total number is composed by 88% of chrysotile/asbestiform antigorite and 12% is made by amphiboles asbestos Notes: From the Lanzo Valleys and Balangero Plain in northwest Italy
Test Method Details, Test Condition Details, and Test Consistency Details	In 2020, surface water and groundwater were sampled from Lanzo Valleys and Balangero Plain.; NA; NA
System Type Design	NA
Sampling Frequency and Sampling Details	4 surface water and 17 groundwater were collected in October and 1 groundwater sampled in February; Surface water samples were collected from the Stura river; in the plain, groundwater samples were collected by static sampling using bailers in piezometers or wells, bottles were directly filled from private wells which were equipped with pump and tap system
Test Temperature	NA
Results Details	asbestos concentration in water = 2.0 ug/L (chrysotile, asbestiform antigorite and tremolite/actinolite asbestos) [Regarding relative minerals abundance, chrysotile/ asbestiform antigorite fibers were approximately 22% of the total number of fibers detected, while tremolite/actinolite asbestos constituted the 3% of the total: thus, asbestos constitute the 25% of the total number of asbestiform particles observed. Considering just asbestos, the total number is composed by 88% of chrysotile/ asbestiform antigorite and 12% is made by amphiboles asbestos.]
Analytical Method and Analytical Details	SEM analyses with Energy Dispersive Spectroscopy; NA
Transformation Products, Statistics, and Kinetics	NA; NA; NA
Reference Substance and Reference Substance Results	NA; NA

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified definitively.
	Metric 2:	Test Substance Purity	Medium	The tested substance was a mix of asbestos forms.
Domain 2: Test Design				
	Metric 3:	Study Controls	N/A	The metric is not applicable to this study type.
	Metric 4:	Test Substance Stability	Medium	The test substance stability, homogeneity, preparation or storage conditions were not all reported; however, these factors were not likely to influence the test substance or were not likely to have a substantial impact on study results.
Domain 3: Test Conditions				

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Study Citation:	Avataneo, C., Belluso, E., Capella, S., Cocca, D., Lasagna, M., Pigozzi, G., De Luca, D. A. (2021). GROUNDWATER ASBESTOS POLLUTION FROM NATURALLY OCCURRING ASBESTOS (NOA): A PRELIMINARY STUDY ON THE LANZO VALLEYS AND BALANGERO PLAIN AREA, NW ITALY. (Special Issue):5-9.
OECD Harmonized Template:	Miscellaneous
HERO ID:	10190487

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 5:	Test Method Suitability	Medium	The test method was suitable for the test substance with minor deviations.
	Metric 6:	Testing Conditions	N/A	The metric is not applicable to this study type.
	Metric 7:	Testing Consistency	Medium	There were inconsistencies in samples or study groups that are likely to have a substantial impact on results.
	Metric 8:	System Type and Design	N/A	The metric is not applicable to this study type.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology addressed or reported the intended outcome(s) of interest.
	Metric 12:	Test Substance Purity	Medium	Minor limitations were identified in sampling methods of the outcome(s) of interest were reported.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Low	There is concern that variability or uncertainty was likely to have a substantial impact on the results by the authors.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	The target chemical extraction efficiency, percent recovery, or mass balance were not reported; however, these omissions were not likely to have a substantial impact on study results.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	The analysis of data was clearly described.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	The study results were reasonable.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

Overall Quality Determination — Low

Study Citation:	Bales, R. C., Newkirk, D. D., Hayward, S. B. (1984). CHRYSOTILE ASBESTOS IN CALIFORNIA SURFACE WATERS - FROM UPSTREAM RIVERS THROUGH WATER-TREATMENT. Journal of the American Water Works Association 76(5):66-74.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3582727

EXTRACTION

Parameter	**Data**
CASRN and Test Material	12001-29-5; Chrysotile fiber
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; Source-water reservoirs in the Metropolitan Water District of Sourthern California; NR; NR
Test Method Details, Test Condition Details, and Test Consistency Details	Fiber concentrations were measured in influent and effluent at 5 water treatment plants.; Not reported; Not reported
System Type Design	Not reported
Sampling Frequency and Sampling Details	14 or 15 observations at each location; Not reported
Test Temperature	Not reported
Results Details	Removal of fibers by coagulation and filtration during water treatment (%): Jensen: >97.7; Weymouth: 99.0; Diemer: 99.2; Mills: 99.8; Skinner: >86
Analytical Method and Analytical Details	Not reported; Not reported
Transformation Products, Statistics, and Kinetics	Not reported; Mean fiber concentrations in effluent from water plants were all <5.4 10^6 fibers/L.; Not reported
Reference Substance and Reference Substance Results	Not reported; Not reported

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified using common nomenclature.
	Metric 2:	Test Substance Purity	Medium	The test substance purity was not reported, however the omission is unlikely to have an impact on the study results.
Domain 2: Test Design				
	Metric 3:	Study Controls	Medium	Controls were not reported but the omission is unlikely to have a substantial impact on the study results.
	Metric 4:	Test Substance Stability	N/A	The metric is not applicable to the study type.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	N/A	The metric is not applicable to the study type.
	Metric 6:	Testing Conditions	Low	Some of the testing conditions were not reported.
	Metric 7:	Testing Consistency	Medium	The testing conditions across sample groups could not be evaluated; however the omissions are unlikely to have a substantial impact on the study results.
	Metric 8:	System Type and Design	N/A	The metric is not applicable to the study type.

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Study Citation:	Bales, R. C., Newkirk, D. D., Hayward, S. B. (1984). CHRYSOTILE ASBESTOS IN CALIFORNIA SURFACE WATERS - FROM UPSTREAM RIVERS THROUGH WATER-TREATMENT. Journal of the American Water Works Association 76(5):66-74.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3582727

			EVALUATION	
Domain		Metric	Rating	Comments
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to the study type.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to the study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology addressed the intended outcome of interest.
	Metric 12:	Test Substance Purity	Medium	Some details regarding the sampling methods were not reported; however, the omissions are unlikely to have a substantial impact on the study results.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	High	Variability in the concentration measurements were reported.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to the study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Low	The analytical method used to quantify fibers was not clearly described which may have an impact on the study results.
	Metric 16:	Statistical Methods and Kinetic Calculations	Medium	No statistical analysis was reported and data was not provided to perform an independent analysis; however, the omission is unlikely to have a substantial impact on the study results.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Low	Due to limited information, evaluation of the reasonableness of the study results was not possible.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to the study type.

Overall Quality Determination — Medium

Study Citation:	Bales, R. C., Newkirk, D. D., Hayward, S. B. (1984). CHRYSOTILE ASBESTOS IN CALIFORNIA SURFACE WATERS - FROM UPSTREAM RIVERS THROUGH WATER-TREATMENT. Journal of the American Water Works Association 76(5):66-74.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3582727

EXTRACTION

Parameter	**Data**
CASRN and Test Material	12001-29-5; Chrysotile fiber
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; Source-water reservoirs in the Metropolitan Water District of Sourthern California; NR; NR Notes: The chrysotile content of the principally serpentine, ultramafic areas in California varies from near 0 to 100%
Test Method Details, Test Condition Details, and Test Consistency Details	Fiber concentrations were measured in the influent and effluent of downstream source-water reservoirs.; Retention time of reservoirs (years): Lake Pyramid-Castaic: 3.0; Lake Silverwood: 0.1; Lake Perris: 1.5; Lake Skinner: 0.5; Not reported
System Type Design	Not reported
Sampling Frequency and Sampling Details	Number of observations (influent and effluent) for Lake Pyramid-Castaic, Silverwood, Perris, and Skinner, respectively: 3 and 16, 3 and 14, 14 and 15, 15 and 16.; Not reported
Test Temperature	Not reported
Results Details	Removal of fibers (%): Lake Pyramid-Castaic: 99.8; Lake Silverwood: 27; Lake Perris: 96; Lake Skinner: 88
Analytical Method and Analytical Details	Not reported; Not reported
Transformation Products, Statistics, and Kinetics	Not reported; Mean fiber concentrations (10^6 fibers/L) in effluents ranged from 2.2 (Lake Pyramid-Castaic) to 720 (Lake Silverwood); Not reported
Reference Substance and Reference Substance Results	Not reported; Not reported

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified using common nomenclature.
	Metric 2:	Test Substance Purity	Medium	The test substance purity was not reported, however the omission is unlikely to have an impact on the study results.
Domain 2: Test Design				
	Metric 3:	Study Controls	Medium	Controls were not reported but the omission is unlikely to have a substantial impact on the study results.
	Metric 4:	Test Substance Stability	N/A	The metric is not applicable to the study type.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	N/A	The metric is not applicable to the study type.
	Metric 6:	Testing Conditions	Low	Some of the testing conditions were not reported.
	Metric 7:	Testing Consistency	Medium	The testing conditions across sample groups could not be evaluated; however the omissions are unlikely to have a substantial impact on the study results.
	Metric 8:	System Type and Design	N/A	The metric is not applicable to the study type.

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Study Citation:	Bales, R. C., Newkirk, D. D., Hayward, S. B. (1984). CHRYSOTILE ASBESTOS IN CALIFORNIA SURFACE WATERS - FROM UPSTREAM RIVERS THROUGH WATER-TREATMENT. Journal of the American Water Works Association 76(5):66-74.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3582727

			EVALUATION	
Domain		Metric	Rating	Comments
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to the study type.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to the study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology addressed the intended outcome of interest.
	Metric 12:	Test Substance Purity	Medium	Some details regarding the sampling methods were not reported; however, the omissions are unlikely to have a substantial impact on the study results.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	High	Variability in the concentration measurements were reported.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to the study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Low	The analytical method used to quantify fibers was not clearly described which may have an impact on the study results.
	Metric 16:	Statistical Methods and Kinetic Calculations	Medium	No statistical analysis was reported and data was not provided to perform an independent analysis; however, the omission is unlikely to have a substantial impact on the study results.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Low	Due to limited information, evaluation of the reasonableness of the study results was not possible.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to the study type.

Overall Quality Determination Medium

Study Citation:	Buckley, S. G., Lipkin, J., Baxter, L. L., Moehrle, R., Ross, J. R., Mower, G., Munson, W. (2000). Cofiring of propellant washout residue with traditional boiler fuels: Resolution of operational and environmental issues. NATO science series, II: mathematics, physics and chemistry, vol. 3 3:37-48.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3745359

EXTRACTION

Parameter	**Data**
CASRN and Test Material	not reported; Asbestos
Confidentiality, Type, Guideline	No; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	Not Reported; Not Reported; Not Reported; Not Reported
Radiolabel, Source, State, Purity	Not Reported; rocket motor washout residue; Not Reported; Not Reported Notes: Approximate composition: 5% ammonium perchlorate, 55% aluminum powder, 40% polybutadiene rubber binder, up to 1% asbestos
Test Method Details, Test Condition Details, and Test Consistency Details	Material (3-8 mm granular energetic material-derived fuel) was fed into system and combustions products and fly ash were sampled.; gas residence times 1.3-2 seconds; Samples collected over a wide range of experimental conditions
System Type Design	Multifuel combustor
Sampling Frequency and Sampling Details	Not Reported; samples collected sing a 4 inch diameter probe with a 333-micron mesh screen
Test Temperature	600, 700, 800, 900, 1000, 1100, and 1200°C
Results Details	Asbestos fibers were found in unburned rubber particles in ash only when temperatures were $\leq$900°C; no free-floating asbestos was found in ash at any temperature; heat-conversion of asbestos (into amorphous, relatively spherical particles) occurred at 1000, 1100, and 1200°C
Analytical Method and Analytical Details	combustion products quantified using NDIR NOx, CO, CO2, SO2 analyzers and a paramagnetic O2 analyzer; detection limits of most hydrocarbons ~ 10ppm on a molar basis
Transformation Products, Statistics, and Kinetics	conversion to aluminum/magnesium silicates; not reported; not reported
Reference Substance and Reference Substance Results	not reported; not reported

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified.
	Metric 2:	Test Substance Purity	High	Composition of waste reported.
Domain 2: Test Design				
	Metric 3:	Study Controls	N/A	This metric is not applicable to this study type.
	Metric 4:	Test Substance Stability	N/A	This metric is not applicable to this study type.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	N/A	This metric is not applicable to this study type.
	Metric 6:	Testing Conditions	High	General combustion conditions were reported.
	Metric 7:	Testing Consistency	N/A	This metric is not applicable to this study type.
	Metric 8:	System Type and Design	High	Limited detail regarding reactor.

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Study Citation:	Buckley, S. G., Lipkin, J., Baxter, L. L., Moehrle, R., Ross, J. R., Mower, G., Munson, W. (2000). Cofiring of propellant washout residue with traditional boiler fuels: Resolution of operational and environmental issues. NATO science series, II: mathematics, physics and chemistry, vol. 3 3:37-48.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3745359

			EVALUATION	
Domain		Metric	Rating	Comments
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	This metric is not applicable to this study type.
	Metric 10:	Sampling Methods	N/A	This metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Medium	Qualitative results on waste with less than 1% asbestos.
	Metric 12:	Test Substance Purity	High	Sampling was appropriate.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	N/A	This metric is not applicable to this study type.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	This metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	Qualitative results.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	This metric is not applicable to this study type.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Medium	Qualitative results appear reasonable based on reported data.
	Metric 18:	QSAR Models	N/A	This metric is not applicable to this study type.

Overall Quality Determination — High

Study Citation:	Carneiro, G. O., Santos, T. A., Simonelli, G., Ribeiro, D. V., Cilla, M. S., Dias, C. M. R. (2021). Thermal treatment optimization of asbestos cement waste (ACW) potentializing its use as alternative binder. Journal of Cleaner Production 320:28801-28801.
OECD Harmonized Template:	Miscellaneous
HERO ID:	10066999

EXTRACTION

Parameter	**Data**
CASRN and Test Material	12001-29-5; asbestos cement waste
Confidentiality, Type, Guideline	none; experimental; experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	None; Corrugated roof tiles collected from homes in Salvador, Bahia, Brazil.; fibrous bundles; 6.31% Notes: calcite: 67.4%; quartz: 0.53%; dolomite: 4.4%; gypsum: 4.66%; amorphous content: 16.7%
Test Method Details, Test Condition Details, and Test Consistency Details	waste was placed in electric oven and heated from ambient to sintering temperature at 20 °C/min, the material was kept for the corresponding calcination time, with the automatic shutdown of the heating system, the samples cooled naturally in the furnace.; asbestos cement waste was thermally treated at 600°C for 1 or 3 hours with a starting test material of 1 or 5 kg.; test were consistent
System Type Design	complete 2k factorial project with a central point.
Sampling Frequency and Sampling Details	at completion of test; Not Reported
Test Temperature	600 °C
Results Details	% chrysotile remaining at starting conditions of hours/kg of material: 3.71% 1/1; 1.49% 3/1; 5.59% 1/5; 2.35% 3/5
Analytical Method and Analytical Details	thermogravimetric and mineralogical; thermobalance and X-ray diffraction
Transformation Products, Statistics, and Kinetics	calcite (64.71-67.01%); quartz (0.59-1.67%); dolomite (2.27-4.69%); anhydrite (0-0.96%); CO2 (4.99-9.75%); The chrysotile contents decreased with increasing calcination time and decreasing ACWT mass in heat treatment implemented at 600 °C.; energy consumption: 20.82-38.07 kW.h/kg
Reference Substance and Reference Substance Results	not applicable; Not Reported

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Test Substance			
Metric 1:	Test Substance Identity	High	The test substance was identified by name.
Metric 2:	Test Substance Purity	High	The test substance identity and purity were verified by analytical means.
Domain 2: Test Design			
Metric 3:	Study Controls	N/A	The study did not require concurrent control groups.
Metric 4:	Test Substance Stability	N/A	The metric is not applicable to this study type.
Domain 3: Test Conditions			
Metric 5:	Test Method Suitability	High	The test method was suitable for the test substance.
Metric 6:	Testing Conditions	High	Testing conditions were monitored, reported, and appropriate for the method.
Metric 7:	Testing Consistency	High	Test conditions were consistent.
Metric 8:	System Type and Design	N/A	The metric is not applicable to this study type.
Domain 4: Test Organisms			

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Study Citation:	Carneiro, G. O., Santos, T. A., Simonelli, G., Ribeiro, D. V., Cilla, M. S., Dias, C. M. R. (2021). Thermal treatment optimization of asbestos cement waste (ACW) potentializing its use as alternative binder. Journal of Cleaner Production 320:28801-28801.
OECD Harmonized Template:	Miscellaneous
HERO ID:	10066999

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology addressed or reported the intended outcome of interest.
	Metric 12:	Test Substance Purity	High	The study reported the use of sampling methods that address the outcome of interest, and used widely accepted methods/approaches for the chemical and media being analyzed.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Medium	Sources of variability and uncertainty in the measurements and statistical techniques and between study groups were reported in the study.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	The target chemical and transformation product concentrations were reported.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	Statistical methods or kinetic calculations were clearly described and address the dataset.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	Reported values were expected.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

Overall Quality Determination — High

Study Citation:	Carneiro, G. O., Santos, T. A., Simonelli, G., Ribeiro, D. V., Cilla, M. S., Dias, C. M. R. (2021). Thermal treatment optimization of asbestos cement waste (ACW) potentializing its use as alternative binder. Journal of Cleaner Production 320:28801-28801.
OECD Harmonized Template:	Miscellaneous
HERO ID:	10066999

EXTRACTION

Parameter	**Data**
CASRN and Test Material	12001-29-5; asbestos cement waste
Confidentiality, Type, Guideline	none; experimental; experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	None; Corrugated roof tiles collected from homes in Salvador, Bahia, Brazil.; fibrous bundles; 6.31% Notes: calcite (CaCO3): 67.4%; quartz (SiO2): 0.53%; dolomite: 4.4%; gypsum (CaSO4): 4.66%; amorphous content: 16.7%
Test Method Details, Test Condition Details, and Test Consistency Details	waste was placed in electric oven and heated from ambient to sintering temperature at 20 °C/min, the material was kept for the corresponding calcination time, with the automatic shutdown of the heating system, the samples cooled naturally in the furnace.; asbestos cement waste was thermally treated at 700°C for 2 hours with a starting test material of 3 kg.; test was conducted 3 times
System Type Design	complete 2k factorial project with a central point.
Sampling Frequency and Sampling Details	at completion of test; Not Reported
Test Temperature	700 °C
Results Details	% chrysotile remaining: 0.00%; 0.00%; 0.00%
Analytical Method and Analytical Details	thermogravimetric and mineralogical; thermobalance and X-ray diffraction
Transformation Products, Statistics, and Kinetics	quartz increase (0.72-0.99%); dolomite decrease (0.42-0.92%); anhydrite (0.60-1.30%); α' H–C2S (17.87-19.08%); β-C2S (3.54-4.23%); γ-C2S (2.82-3.22%); CO2 (11.54-14.62%); calcite decreased from 67.4% to 41.41-42.58%; amorphous content increased from 16.70% to 29.80-30.50%; energy consumption: 31.48 kW.h/kg
Reference Substance and Reference Substance Results	not applicable; Not Reported

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified by name.
	Metric 2:	Test Substance Purity	High	The test substance identity and purity were verified by analytical means.
Domain 2: Test Design				
	Metric 3:	Study Controls	N/A	The study did not require concurrent control groups.
	Metric 4:	Test Substance Stability	N/A	The metric is not applicable to this study type.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	The test method was suitable for the test substance.
	Metric 6:	Testing Conditions	High	Testing conditions were monitored, reported, and appropriate for the method.
	Metric 7:	Testing Consistency	High	Test conditions were consistent.
	Metric 8:	System Type and Design	N/A	The metric is not applicable to this study type.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.

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Study Citation:	Carneiro, G. O., Santos, T. A., Simonelli, G., Ribeiro, D. V., Cilla, M. S., Dias, C. M. R. (2021). Thermal treatment optimization of asbestos cement waste (ACW) potentializing its use as alternative binder. Journal of Cleaner Production 320:28801-28801.
OECD Harmonized Template:	Miscellaneous
HERO ID:	10066999

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology addressed or reported the intended outcome of interest.
	Metric 12:	Test Substance Purity	High	The study reported the use of sampling methods that address the outcome of interest, and used widely accepted methods/approaches for the chemical and media being analyzed.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Medium	Sources of variability and uncertainty in the measurements and statistical techniques and between study groups were reported in the study.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	The target chemical and transformation product concentrations were reported.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	Statistical methods or kinetic calculations were clearly described and address the dataset.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	Reported values were expected.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

Overall Quality Determination — High

Study Citation:	Carneiro, G. O., Santos, T. A., Simonelli, G., Ribeiro, D. V., Cilla, M. S., Dias, C. M. R. (2021). Thermal treatment optimization of asbestos cement waste (ACW) potentializing its use as alternative binder. Journal of Cleaner Production 320:28801-28801.
OECD Harmonized Template:	Miscellaneous
HERO ID:	10066999

EXTRACTION

Parameter	**Data**
CASRN and Test Material	12001-29-5; asbestos cement waste
Confidentiality, Type, Guideline	none; experimental; experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	None; Corrugated roof tiles collected from homes in Salvador, Bahia, Brazil.; fibrous bundles; 6.31% Notes: calcite: 67.4%; quartz: 0.53%; dolomite: 4.4%; gypsum: 4.66%; amorphous content: 16.7%
Test Method Details, Test Condition Details, and Test Consistency Details	waste was placed in electric oven and heated from ambient to sintering temperature at 20 °C/min, the material was kept for the corresponding calcination time, with the automatic shutdown of the heating system, the samples cooled naturally in the furnace.; asbestos cement waste was thermally treated at 800°C for 1 or 3 hours with a starting test material of 1 or 5 kg.; test were consistent
System Type Design	complete 2k factorial project with a central point.
Sampling Frequency and Sampling Details	at completion of test; Not Reported
Test Temperature	800 °C
Results Details	0.00% chrysotile remained after all 4 starting conditions (hours/kg): 1/1; 3/1; 1/5; 3/5
Analytical Method and Analytical Details	thermogravimetric and mineralogical; thermobalance and X-ray diffraction
Transformation Products, Statistics, and Kinetics	quartz (0.10-0.79%); anhydrite (0.41-1.16%); vaterite (0.00-3.84%); wollastonite (0.00-0.65%); CaO (0.00-8.01%); merwinite (2.40-10.66%); α' H–C2S (20.64-30.48%); β-C2S (2.41-10.06%); γ-C2S (1.53-2.39%); CO2 (16.75-25.97%); calcite decreased from 67.4% to 2.16-29.00%; dolomite was completely removed; amorphous content increased from 16.70% to 27.20-29.20%; energy consumption: 24.88-42.13 kW.h/kg
Reference Substance and Reference Substance Results	not applicable; Not Reported

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified by name.
	Metric 2:	Test Substance Purity	High	The test substance identity and purity were verified by analytical means.
Domain 2: Test Design				
	Metric 3:	Study Controls	N/A	The study did not require concurrent control groups.
	Metric 4:	Test Substance Stability	N/A	The metric is not applicable to this study type.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	The test method was suitable for the test substance.
	Metric 6:	Testing Conditions	High	Testing conditions were monitored, reported, and appropriate for the method.
	Metric 7:	Testing Consistency	High	Test conditions were consistent.
	Metric 8:	System Type and Design	N/A	The metric is not applicable to this study type.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.

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Study Citation:	Carneiro, G. O., Santos, T. A., Simonelli, G., Ribeiro, D. V., Cilla, M. S., Dias, C. M. R. (2021). Thermal treatment optimization of asbestos cement waste (ACW) potentializing its use as alternative binder. Journal of Cleaner Production 320:28801-28801.
OECD Harmonized Template:	Miscellaneous
HERO ID:	10066999

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology addressed or reported the intended outcome of interest.
	Metric 12:	Test Substance Purity	High	The study reported the use of sampling methods that address the outcome of interest, and used widely accepted methods/approaches for the chemical and media being analyzed.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Medium	Sources of variability and uncertainty in the measurements and statistical techniques and between study groups were reported in the study.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	The target chemical and transformation product concentrations were reported.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	Statistical methods or kinetic calculations were clearly described and address the dataset.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	Reported values were expected.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

Overall Quality Determination — High

Study Citation:	Gaggero, L., Caratto, V., Ferretti, M. (2016). Self-sustained combustion synthesis and asbestos-bearing waste: Scaling up from laboratory towards pre-industrial size plant. Energy Procedia 97:515-522.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6871198

EXTRACTION

Parameter	Data
CASRN and Test Material	Not Reported; Asbestos-Containing Waste (ACW)
Confidentiality, Type, Guideline	No; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; NR; friable fibrous waste; NR Notes: NR
Test Method Details, Test Condition Details, and Test Consistency Details	Self-propagating High temperature Synthesis combustion (SHS); continuous batch treatment in a prototype system with capacity up to 500 g for conversion of asbestos waste into an inert mineral grains; pre-heating of the waste (reactions could not be triggered below 400°C); Reactants for SHS: Fe2O3 (La Betoncolor s.a.s, 96% purity) and Magnesium powder (Chemetall Italia S.r.l. 99% purity, grain size 63 – 100 μm); Amount of friable asbestos in ACW materials tested: 50, 60, 70 and 75 wt% waste; ACW was mixed with reactants and placed in the oven. Reaction initiated with oxyacetylene torch.; Composition of ACW not reported; maximum reaction temperatures for individual runs not reported
System Type Design	prototype oven
Sampling Frequency and Sampling Details	not reported; not reported
Test Temperature	pre-heating 400 or 450°C
Results Details	Post SHS reaction microphotographs show granular morphologies and fiber morphologies were absent; in one sample some elongated grains were observed with a ratio L/d < 3 suggesting loss of fibrous habit..
Analytical Method and Analytical Details	Samples characterized before and after heating using a scanning electron microscope equipped with a Apollo X detector and Microanalysis TEAM EDS System; x-ray diffraction using a diffractometer; Author reports asbestos conversion to olivine was achieved by preheating at 450°C for 300 seconds
Transformation Products, Statistics, and Kinetics	olivine; not reported; not reported
Reference Substance and Reference Substance Results	not reported; not reported

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified.
	Metric 2:	Test Substance Purity	Medium	Source and purity, composition were not reported; %friable asbestos reported.
Domain 2: Test Design				
	Metric 3:	Study Controls	N/A	This metric is not applicable to this study type.
	Metric 4:	Test Substance Stability	N/A	This metric is not applicable to this study type.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	Low	Non-industrial, experimental process examined.
	Metric 6:	Testing Conditions	Low	Several testing condition parameters were omitted (durations; full range of temperatures).

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Study Citation:	Gaggero, L., Caratto, V., Ferretti, M. (2016). Self-sustained combustion synthesis and asbestos-bearing waste: Scaling up from laboratory towards pre-industrial size plant. Energy Procedia 97:515-522.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6871198

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 7:	Testing Consistency	N/A	Due to limited details, this metric could not be evaluated.
	Metric 8:	System Type and Design	Medium	Prototype system used.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	This metric is not applicable to this study type.
	Metric 10:	Sampling Methods	N/A	This metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Low	Qualitative results reported.
	Metric 12:	Test Substance Purity	Low	No details regarding sampling.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	N/A	This metric is not applicable to this study type.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	This metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Low	Test material concentration and mass balance not reported; SHS reaction temperatures not reported.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	This metric is not applicable to this study type.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Low	Due to limited information, evaluation of the reasonableness of the study results was not possible. Qualitative results from experimental prototype system.
	Metric 18:	QSAR Models	N/A	This metric is not applicable to this study type.

Overall Quality Determination — Low

Study Citation:	Gualtieri, A. F., Gualtieri, M. L., Tonelli, M. (2008). In situ ESEM study of the thermal decomposition of chrysotile asbestos in view of safe recycling of the transformation product. Journal of Hazardous Materials 156(1-3):260-266.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3582756

EXTRACTION

Parameter	**Data**
CASRN and Test Material	12001-29-5; Chrysotile fibers
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	Not Reported; Not Reported; Not Reported; Not Reported
Radiolabel, Source, State, Purity	Not Reported; commercial cement-asbestos; Not Reported; calcite (56.7 wt%), CHS (calcium hydrate silicates)phases and amorphous phase (21.8 wt%), serpentine asbestosclinochrysotile (13.6 wt%), -larnite (2CaO·SiO2) (6.8 wt%),quartz (0.8 wt%), hematite (0.2 wt%), and dolomite (0.1 wt%)
Test Method Details, Test Condition Details, and Test Consistency Details	The samples were heated at ~20°C/min; A FEI Quanta 200 ESEM equipped with a thermal tungsten gun, a gaseous secondary electron detector (GSED), and a 1500°C hot stage for in situ electron imaging.; Controlled ESEM experiments were repeated twice with reproducible results.
System Type Design	1.9–3.5 Torr for He and 2.5-3.4 Torr for water vapor atm
Sampling Frequency and Sampling Details	images collected throughout temperature ranges; Not applicable
Test Temperature	25–1150°C for He atm and 25-1300°C for water vapor atm
Results Details	He atm: newly formed crystals on the fiber surface appear up to 1000°and crystallization continues up to 1150°C. Water vapor atmosphere: complete recrystallization is not accomplished during the non-isothermal experiment up to 1300°C
Analytical Method and Analytical Details	High-magnification SEM micrographs using a Philips XL 40/604 instrument.; Not applicable
Transformation Products, Statistics, and Kinetics	dehydroxylation of chrysotile and recrystallization into non-hazardous minerals (akermanite; ferrite; merwinite; and silicocarnotite); Not applicable; reaction kinetics were slowed down in water vapor atmosphere compared to He atmosphere; recrystallization only observed after thermal treatment at 1000°C
Reference Substance and Reference Substance Results	Gold; Use to calibrate temperature

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified definitively.
	Metric 2:	Test Substance Purity	High	The source or purity of the test substance was reported and purity was cited to another source.
Domain 2: Test Design				
	Metric 3:	Study Controls	High	A negative control and positive control were included for visual comparison purposes.
	Metric 4:	Test Substance Stability	High	The test substance stability, homogeneity, preparation, and were appropriate for the study.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	The test method was suitable for the test substance.
	Metric 6:	Testing Conditions	High	Testing conditions were monitored, reported, and appropriate for the method.

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Study Citation:	Gualtieri, A. F., Gualtieri, M. L., Tonelli, M. (2008). In situ ESEM study of the thermal decomposition of chrysotile asbestos in view of safe recycling of the transformation product. Journal of Hazardous Materials 156(1-3):260-266.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3582756

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 7:	Testing Consistency	High	Test conditions were consistent across samples or study groups. The conditions of the exposure were documented.
	Metric 8:	System Type and Design	N/A	This metric is not applicable to the study type.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	This metric is not applicable to the study type.
	Metric 10:	Sampling Methods	N/A	This metric is not applicable to the study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Low	The outcome assessment methodology did not quantify the rate of reaction or activation energy, as was done in referenced studies.
	Metric 12:	Test Substance Purity	High	The study reported the use of sampling methods that address the outcome(s) of interest.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	High	Sources of variability and uncertainty in the measurements, and statistical techniques and between study groups were considered and accounted for in data evaluation.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	This metric is not applicable to the study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Low	The target chemical and transformation product(s) concentrations were not reported, preventing meaningful interpretation of study results.
	Metric 16:	Statistical Methods and Kinetic Calculations	Low	Statistical analysis or kinetic calculations were not conducted or were not described clearly.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	The study results were reasonable.
	Metric 18:	QSAR Models	N/A	This metric is not applicable to the study type.

Overall Quality Determination Low

Study Citation:	Henson, E. B. (1985). Asbestos fibers in lakes and streams. Verhandlungen: Internationale Vereinigung für Theoretische und Angewandte Limnologie 22(4):2232-2237.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6898503

EXTRACTION

Parameter	Data
CASRN and Test Material	not reported; asbestos fibers (chrysotile)
Confidentiality, Type, Guideline	No; experimental; experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; NR; NR; NR Notes: NR
Test Method Details, Test Condition Details, and Test Consistency Details	Daphnia pulex and cultures of Paramaecium were exposed to an asbestos mixture.; Not Reported; Not Reported
System Type Design	Not Reported
Sampling Frequency and Sampling Details	Not Reported; Not Reported
Test Temperature	Not Reported
Results Details	Fate related results were not reported.
Analytical Method and Analytical Details	Not Reported; Not Reported
Transformation Products, Statistics, and Kinetics	Not Reported; Not Reported; Not Reported
Reference Substance and Reference Substance Results	Not Reported; Not Reported

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Test Substance			
Metric 1:	Test Substance Identity	High	The test substance was identified.
Metric 2:	Test Substance Purity	Low	Source and purity not reported.
Domain 2: Test Design			
Metric 3:	Study Controls	Uninformative	Controls related to fate not included.
Metric 4:	Test Substance Stability	N/A	Not applicable.
Domain 3: Test Conditions			
Metric 5:	Test Method Suitability	N/A	Not applicable.
Metric 6:	Testing Conditions	N/A	Not applicable.
Metric 7:	Testing Consistency	N/A	Not applicable.
Metric 8:	System Type and Design	N/A	Not applicable.
Domain 4: Test Organisms			
Metric 9:	Outcome Assessment Methodology	N/A	Not applicable.

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Study Citation:	Henson, E. B. (1985). Asbestos fibers in lakes and streams. Verhandlungen: Internationale Vereinigung für Theoretische und Angewandte Limnologie 22(4):2232-2237.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6898503

		EVALUATION		
Domain		Metric	Rating	Comments
	Metric 10:	Sampling Methods	N/A	Not applicable.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Uninformative	Fate related outcome not evaluated.
	Metric 12:	Test Substance Purity	N/A	Not applicable.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	N/A	Not applicable.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	Not applicable.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	N/A	Not applicable.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	Not applicable.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Uninformative	Fate related outcome not reported.
	Metric 18:	QSAR Models	N/A	Not applicable.

Overall Quality Determination — Uninformative

Study Citation:	Hunsinger, R. B., Roberts, K. J., Lawrence, J. (1980). CHRYSOTILE ASBESTOS FIBER REMOVAL DURING POTABLE WATER-TREATMENT - PILOT-PLANT STUDIES. Environmental Science and Technology 14(3):333-336.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3583339

EXTRACTION

Parameter	**Data**
CASRN and Test Material	1332-21-4; Asbestos fiber
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; Humber River water; NR; NR Notes: spiked with chrysotile asbestos
Test Method Details, Test Condition Details, and Test Consistency Details	Samples taken from the Ministry of the Environment Research Test Facility in Toronto. Humber River water with initial asbestos levels of 5E5 fibers L-1.; Spiked Humber River water with initial asbestos levels of 0.81E6 to 17E6 fibers L-1.; Not applicable
System Type Design	Ultracentrifugation of samples followed by ultrasonic resuspension of the residue in 1 mL of water, and placing a 1 uL drop of this suspension on a 3-mm carbon-coated electron microscope grid.
Sampling Frequency and Sampling Details	hourly in the plant, half-hourly when the turbidity of the effluent had reached a steady state; Samples taken at the Humber River water, supply tank, feed water, at the inflow to the flocculation chamber prior to coagulant addition and after asbestos and sodium hypochlorite added, postsedimentation water, dual media effluents, sand filter effluents.
Test Temperature	Not applicable
Results Details	Asbestos fiber in the finished waters were <0.05E6 to 1.6E6 fibers/L after dual media filter #1; <0.05E6 to 0.8E6 fibers/L after dual media filter #2 and ,0.05E6 to 1.9E6 fibers/L after the sand filter; fiber concentrations in all but two runs and <5E5 fibers/L in 76% of the cases
Analytical Method and Analytical Details	Siemens 101 transmission electron microscope at x20,000 magnification; Not applicable
Transformation Products, Statistics, and Kinetics	Not applicable; Lack of relationship between initial and final concentrations; due to inconsistencies in the processes or inherent inaccuracies in the analytical methodology.; Not applicable
Reference Substance and Reference Substance Results	Not applicable; Not applicable

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified definitively.
	Metric 2:	Test Substance Purity	High	The source or purity of the test substance was reported.
Domain 2: Test Design				
	Metric 3:	Study Controls	N/A	The study did not require concurrent control groups.
	Metric 4:	Test Substance Stability	Medium	The test substance stability, homogeneity, preparation or storage conditions were not reported; however, these factors were not likely to influence the test substance or were not likely to have a substantial impact on study results.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	The test method was suitable for the test substance.
	Metric 6:	Testing Conditions	High	Testing conditions were monitored, reported, and appropriate for the method.

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Study Citation:	Hunsinger, R. B., Roberts, K. J., Lawrence, J. (1980). CHRYSOTILE ASBESTOS FIBER REMOVAL DURING POTABLE WATER-TREATMENT - PILOT-PLANT STUDIES. Environmental Science and Technology 14(3):333-336.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3583339

			EVALUATION	
Domain	Metric		Rating	Comments
	Metric 7:	Testing Consistency	High	Test conditions were consistent across samples or study groups. The conditions of the exposure were documented.
	Metric 8:	System Type and Design	Medium	Equilibrium was not established or reported but this was not likely to have a substantial impact on study results.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	This metric is not applicable to this type of study.
	Metric 10:	Sampling Methods	N/A	This metric is not applicable to this type of study.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology addressed or reported the intended outcome(s) of interest.
	Metric 12:	Test Substance Purity	High	The study reported the use of sampling methods that address the outcome(s) of interest, and used widely accepted methods/approaches for the chemical and media being analyzed.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Low	There is concern that variability or uncertainty was likely to have a substantial impact on the results.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	This metric is not applicable to this type of study.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	High	The target chemical concentrations were reported.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	Statistical methods or kinetic calculations were clearly described and address the datasets.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Low	Evaluation of the reasonableness of the study results was not possible since a lack of a specific relationship between initial and final concentrations could not be determined.
	Metric 18:	QSAR Models	N/A	This metric is not applicable to this type of study.

Overall Quality Determination — Low

Study Citation:	Jolicoeur, C., Duchesne, D. (1981). INFRARED AND THERMOGRAVIMETRIC STUDIES OF THE THERMAL-DEGRADATION OF CHRYSOTILE ASBESTOS FIBERS - EVIDENCE FOR MATRIX EFFECTS. Canadian Journal of Chemistry 59(10):1521-1526.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6868399

EXTRACTION

Parameter	Data
CASRN and Test Material	12001-29-5; chrysotile fibers
Confidentiality, Type, Guideline	none; experimental; experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	None; 4-T-30 commercial fibers (Johns Manville, Quebec); fibers; ~1% brucite content Notes: Average length of fibers is 0.5 pm; their length distribution peaks at -0.3 pm and the distribution width-at-half-height is 0.5 pm.
Test Method Details, Test Condition Details, and Test Consistency Details	Method 1: static heating. Method 2: dynamic heating.; Method 1: loose chrysotile fibers were heated to a given temperature for 3-4 h. Method 2: Thermogravimetric analyses using a 5°C/min scanning rate.; Method 1 was also preformed using loose fibers pressed in KBr and then put through static heating conditions.
System Type Design	Not Reported
Sampling Frequency and Sampling Details	at several temperatures; after cooling in a desiccator over P205, the sample was weighed and, part of it was pressed in a KBr disc for spectral studies.
Test Temperature	110-900°C
Results Details	100°C-~250°C,1-2% wt loss due to sorbed water; near 400°C, the excess brucite present is dehydrated; near 600°C, dehydroxylation of the Mg-OH groups in the chrysotile lattice occurs (~13% weight loss); at ~810°C the amorphous or partially amorphous anhydride product of this reaction recrystallizes exothermically into forsterite and amorphous silica; at temperatures above 1000°C yields some enstatite.
Analytical Method and Analytical Details	infrared spectrometer; range 300-4000/cm; scanning rates 0.5-3 cm/s
Transformation Products, Statistics, and Kinetics	amorphous silica; forsterite; enstatite; not applicable; The difference between the mid-point temperatures for dehydration of the chrysotile under dynamic and static heating illustrates the slow kinetics of the diffusion-controlled process.
Reference Substance and Reference Substance Results	compared to 2 other studies.; Not Reported

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified by name.
	Metric 2:	Test Substance Purity	High	The source and appropriate properties were reported.
Domain 2: Test Design				
	Metric 3:	Study Controls	Medium	Some concurrent control group details were not included; however, the lack of data was not likely to have a substantial impact on study results.
	Metric 4:	Test Substance Stability	N/A	This metric is not applicable to this type of study.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	The test method was suitable for the test substance.
	Metric 6:	Testing Conditions	High	Testing conditions were monitored, reported, and appropriate for the method.

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Study Citation:	Jolicoeur, C., Duchesne, D. (1981). INFRARED AND THERMOGRAVIMETRIC STUDIES OF THE THERMAL-DEGRADATION OF CHRYSOTILE ASBESTOS FIBERS - EVIDENCE FOR MATRIX EFFECTS. Canadian Journal of Chemistry 59(10):1521-1526.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6868399

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 7:	Testing Consistency	Medium	Some test conditions across samples or study groups were not reported, but these discrepancies were not likely to have a substantial impact on study results.
	Metric 8:	System Type and Design	N/A	This metric is not applicable to this type of study.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	This metric is not applicable to this type of study.
	Metric 10:	Sampling Methods	N/A	This metric is not applicable to this type of study.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology addressed or reported the intended outcome(s) of interest.
	Metric 12:	Test Substance Purity	High	The study reported the use of sampling methods that address the outcome(s) of interest, and used widely accepted methods/approaches for the chemical and media being analyzed.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	High	Sources of variability and uncertainty in the measurements and between study groups were considered and accounted for in data evaluation.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	This metric is not applicable to the study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	The target chemical and transformation product(s) concentrations, extraction efficiency, percent recovery, or mass balance were not reported; however, these omissions were not likely to have a substantial impact on study results.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	Statistical methods or kinetic calculations were clearly described and address the dataset(s).
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	Reported values were within expected range.
	Metric 18:	QSAR Models	N/A	This metric is not applicable to the study type.

Overall Quality Determination — High

Study Citation:	Kebler, D. G., Bales, R. C., Amy, G. L. (1989). Coagulation of submicron colloids by supramicron silica particles. Water Science and Technology 21(6-7):519-528.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6893656

EXTRACTION

Parameter	**Data**
CASRN and Test Material	12001-29-5; Chrysotile asbestos fibers
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; NR; NR; NR Notes: 0.5 µm long x 0.05 µm diameter
Test Method Details, Test Condition Details, and Test Consistency Details	A mixed silica-chrysotile suspension was stirred in a beaker or inverted 2x daily in a column.; Duration: 5 days; concentration of chrysolite = 4.9 ug/L and silica = 11.1 mg/L, suspension in 0.01M NaCl, pH = 8.; Total fiber count in 49 ug/L stock solution 4 days prior to test initiation = 2.9±0.3, 2.8±0.5, 2.3±0.3 and 2.7±0.3 after 1, 24, 48 and 72 hours, respectively.
System Type Design	Open system; two reactors: 1L Pyrex beaker (mixed via stirred) and 0.9L Pyrex settling column (mixed via inversions)
Sampling Frequency and Sampling Details	Samples analyzed on day 3 and day 5; Not reported
Test Temperature	Not reported
Results Details	5-50 fold reduction in fiber concentration observed; total fiber count (10^8 fibers/L) = 0.05±0.08 after 120 hours in beaker experiment and 1.7±0.6 and 0.5±0.2 after 68 and 120 hours, respectively, in the column experiment
Analytical Method and Analytical Details	Total fiber counts: transmission electron microscopy (TEM); Not reported
Transformation Products, Statistics, and Kinetics	Not reported; Standard deviations reported with results; Electrophoretic mobility of silica = -1.8 um/S V/cm; initial mobility measurement of chrysotile = +0.7 um/S V/cm
Reference Substance and Reference Substance Results	Samples with no silica present evaluated as control (4.9 g/L); Relatively constant fiber concentration observed; total fiber count = 4.0±1.6, 2.0±0.8, 2.8±0.4, 1.8±0.4 and 0.7±0.6 after 2, 24, 28, 48 and 144 hours, respectively

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified definitively.
	Metric 2:	Test Substance Purity	Low	The source and composition/purity were not reported.
Domain 2: Test Design				
	Metric 3:	Study Controls	High	Controls were included.
	Metric 4:	Test Substance Stability	N/A	This metric is not applicable to this type of study.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	The test method was suitable for the test substance.
	Metric 6:	Testing Conditions	High	Testing conditions were reported.
	Metric 7:	Testing Consistency	High	Testing was consistent.
	Metric 8:	System Type and Design	Medium	Equilibrium was not reported but this was not likely to have a substantial impact on study results.

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Study Citation:	Kebler, D. G., Bales, R. C., Amy, G. L. (1989). Coagulation of submicron colloids by supramicron silica particles. Water Science and Technology 21(6-7):519-528.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6893656

		EVALUATION		
Domain		Metric	Rating	Comments
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	This metric is not applicable to this type of study.
	Metric 10:	Sampling Methods	N/A	This metric is not applicable to this type of study.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Medium	There was incomplete reporting of outcome assessment methods; however, the absence of details were not likely to be severe or have a substantial impact on the study results.
	Metric 12:	Test Substance Purity	Low	Limited detail on sampling methods.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	High	Reported variability or uncertainty was not likely to influence the outcome assessment.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	This metric is not applicable to this type of study.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Low	Analytical details were omitted.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	This metric is not applicable to this type of study.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Medium	The study results were reasonable.
	Metric 18:	QSAR Models	N/A	This metric is not applicable to this type of study.
Overall Quality Determination			**High**	

Study Citation:	Lauer, W. C., Convery, J. J. (1988). Status of the Potable Water Reuse Demonstration Project at Denver. :443-474.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6892106

EXTRACTION

Parameter	**Data**
CASRN and Test Material	1332-21-4; Asbestos
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; NR; NR; NR Notes: medium and long fibers
Test Method Details, Test Condition Details, and Test Consistency Details	Samples collected as part of the Denver Potable Water Reuse Demonstration Project in which a facility remediated secondary treated wastewater to meet potable water standards.; Flow rate: 0.042 - 1.02 MGD (1 MGD = 0.0438 m^3/s)Detention time: 5.8 - 98.8 min; pH: (6.9 (influent), 6.0 (effluent)Total Alkalinity (CaCO3): 273 (influent), 1 (effluent)TSS: 10 (influent), < 1 (effluent)Specific conductance: 1022 umhos/cm (influent), 49 umhos/cm (effluent)D.O.: 3.3 (influent), 7.9 (effluent)
System Type Design	Rapid mix basin, flocculation basin, chemical clarifier, recarbonation basin, ballast pond, filters, first-stage carbon, ozone basin, second-stage carbon, reverse osmosis, and disinfection stages
Sampling Frequency and Sampling Details	Not reported; Influent and effluent samples collected from October 1, 1985 to March 28, 1986
Test Temperature	16-18°C (influent and effluent)
Results Details	Influent: 12.2 M Fibers/L, Effluent: Below detection limit or more than 50% of data was below the detection limit
Analytical Method and Analytical Details	Not reported; Not reported
Transformation Products, Statistics, and Kinetics	Not Reported; Not Reported; Not Reported
Reference Substance and Reference Substance Results	Not Reported; Not Reported

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified by name.
	Metric 2:	Test Substance Purity	High	The wastewater source was reported generally.
Domain 2: Test Design				
	Metric 3:	Study Controls	Medium	Controls or reference substances were not explicitly included.
	Metric 4:	Test Substance Stability	Medium	Sample preparation or storage were not reported.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	The test method was suitable for the test substance.
	Metric 6:	Testing Conditions	High	Operational conditions and parameters were reported in detail.
	Metric 7:	Testing Consistency	High	Test conditions were consistent throughout the duration of the study.
	Metric 8:	System Type and Design	N/A	Not applicable.
Domain 4: Test Organisms				

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Study Citation:	Lauer, W. C., Convery, J. J. (1988). Status of the Potable Water Reuse Demonstration Project at Denver. :443-474.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6892106

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 9:	Outcome Assessment Methodology	N/A	Not applicable.
	Metric 10:	Sampling Methods	N/A	Not applicable.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology was appropriate for determining removal efficiency.
	Metric 12:	Test Substance Purity	Medium	Sampling methods and frequency were not reported.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Medium	Some test details (analytical and sampling methods) were not reported.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	Not applicable.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Low	Raw data not reported, analytical details not reported.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	Statistical and kinetic calculations were not conducted.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Medium	The results were reasonable but not compared to other studies as the focus was on the design and economic feasibility of this plant for water treatment.
	Metric 18:	QSAR Models	N/A	Not applicable.

Overall Quality Determination — High

Study Citation:	Lawrence, J., Zimmermann, H. W. (1977). ASBESTOS IN WATER - MINING AND PROCESSING EFFLUENT TREATMENT. Journal of Water Pollution Control Federation 49(1):156-160.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3585188

EXTRACTION

Parameter	Data
CASRN and Test Material	12001-29-5; Chrysotile
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	Distilled water; NR; NR; NR
Radiolabel, Source, State, Purity	NR; NR; NR; NR
Test Method Details, Test Condition Details, and Test Consistency Details	Asbestos suspensions allowed to settle and sedimentation rates were determined by visible settling rate or by measuring turbidity as a function of depth.; Not reported; Synthetic suspensions of chrysotile fibers in distilled water at 4E12 fibers/L prepared, 80% fibers < 2 um length.
System Type Design	Suspensions allowed to settle in graduated cylinders.
Sampling Frequency and Sampling Details	Not reported; Not reported
Test Temperature	Not reported
Results Details	Fibers flocculate and settle rapidly (< 10 minutes) until volume reduced to 20% of initial volume, further reduction proceeded more slowly: 19% remaining /24hr; Fiber concentration: 5E11 fibers/L after 1 hr, 1E11 fibers/L after 24 hr.
Analytical Method and Analytical Details	Transmission electron microscope; Not reported
Transformation Products, Statistics, and Kinetics	Not Reported; Not reported; Not reported
Reference Substance and Reference Substance Results	Not Reported; Not Reported

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified by name.
	Metric 2:	Test Substance Purity	High	The test substance was from a commercial source and fiber length was characterized.
Domain 2: Test Design				
	Metric 3:	Study Controls	Medium	Controls or reference substance were not explicitly included.
	Metric 4:	Test Substance Stability	High	Test substance preparation was reported.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	The test method was appropriate.
	Metric 6:	Testing Conditions	Medium	Some testing conditions (temperature, test system size) were not reported.
	Metric 7:	Testing Consistency	High	Test conditions were consistent across replicates.
	Metric 8:	System Type and Design	N/A	Not applicable.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	Not applicable.

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Study Citation:	Lawrence, J., Zimmermann, H. W. (1977). ASBESTOS IN WATER - MINING AND PROCESSING EFFLUENT TREATMENT. Journal of Water Pollution Control Federation 49(1):156-160.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3585188

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 10:	Sampling Methods	N/A	Not applicable.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology was appropriate for determining sedimentation.
	Metric 12:	Test Substance Purity	Medium	Sampling methods and frequency were not reported.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Medium	Some study details were not reported, multiple concentrations were not tested.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	Not applicable.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	High	The analytical method was appropriate, data was reported graphically.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	Statistical and kinetic calculations were not conducted.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Medium	The results were reasonable based on the method but were not compared to previous studies and study details were reported generally.
	Metric 18:	QSAR Models	N/A	Not applicable.
Overall Quality Determination			**High**	

Study Citation:	Lawrence, J., Zimmermann, H. W. (1976). Potable water treatment for some asbestiform minerals: optimization and turbidity data. Water Research 10(3):195-198.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3662078

EXTRACTION

Parameter	Data
CASRN and Test Material	12001-29-5; Asbestos
Confidentiality, Type, Guideline	No; experimental; experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; raw water from Thetford, Drummondville and Asbestos (Quebec); NR; NR Notes: concentrations of asbestos fiber (chrysotile) in water 1.3E9 fibers/L
Test Method Details, Test Condition Details, and Test Consistency Details	Coagulation/flocculation using Alum or polyelectrolyte solutions added to water samples and stirred; filtration through 320 mm sand.; Stirring: 30 rev/min; alum: Al2(SO4)3-16 H20 (concentrations ranged from 20-100 ppm); polyelectrolytes: Calgon Corporation WT2640 (C), WT3000 (A), WT2690 (N) and Dow Chemical Company Sepran NPI0 PWG (N) where (C), (A), and (N) imply cationic, anionic and non-ionic polymers respectively.; not reported
System Type Design	Six paddle stirrer unit with floc illuminator
Sampling Frequency and Sampling Details	not reported; not reported
Test Temperature	not reported
Results Details	alum + non-ionic polyelectrolyte residual fiber concentrations decreased to below LOD to 1.5E6 fibers/L; 35 ppm alum + polyelectrolytes residual fiber concentrations decreased to 1 to 5E5 fibers/L
Analytical Method and Analytical Details	Fiber analysis via transmission electron microscope; LOD: 5E4 fibers/L
Transformation Products, Statistics, and Kinetics	not reported; not reported; not reported
Reference Substance and Reference Substance Results	not reported; not reported

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified.
	Metric 2:	Test Substance Purity	N/A	The metric is not applicable to this type of study.
Domain 2: Test Design				
	Metric 3:	Study Controls	N/A	The metric is not applicable to this type of study.
	Metric 4:	Test Substance Stability	N/A	The metric is not applicable to this type of study.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	N/A	The metric is not applicable to this type of study.
	Metric 6:	Testing Conditions	Low	Testing conditions were not fully reported (ph, temp, etc.)
	Metric 7:	Testing Consistency	N/A	The metric is not applicable to this type of study.
	Metric 8:	System Type and Design	Low	Experimental process

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Study Citation:	Lawrence, J., Zimmermann, H. W. (1976). Potable water treatment for some asbestiform minerals: optimization and turbidity data. Water Research 10(3):195-198.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3662078

			EVALUATION	
Domain		Metric	Rating	Comments
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this type of study.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this type of study.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology addressed or reported the intended outcome of interest.
	Metric 12:	Test Substance Purity	Low	Details regarding sampling methods of the outcome were not fully reported.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	N/A	The metric is not applicable to this type of study.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this type of study.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	High	LOD was reported.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	The metric is not applicable to this type of study.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Low	Experimental system for removal from water.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this type of study.

Overall Quality Determination Medium

Study Citation:	Mcguire, M. J., Bowers, A. E., Bowers, D. A. (1983). OPTIMIZING LARGE-SCALE WATER-TREATMENT PLANTS FOR ASBESTOS-FIBER REMOVAL. Journal of the American Water Works Association 75(7):364-370.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3581621

EXTRACTION

Parameter	Data
CASRN and Test Material	12001-29-5; Chrysotile fibre
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	Not Reported; Not Reported; Not Reported; Not Reported
Radiolabel, Source, State, Purity	Not Reported; commercial cement-asbestos; Not Reported; calcite (56.7 wt%), CHS (calcium hydrate silicates)phases and amorphous phase (21.8 wt%), serpentine asbestosclinochrysotile (13.6 wt%), -larnite (2CaO·SiO2) (6.8 wt%),quartz (0.8 wt%), hematite (0.2 wt%), and dolomite (0.1 wt%)
Test Method Details, Test Condition Details, and Test Consistency Details	Five metropolitan water treatment processes and optimization via coagulation-filtration systems: Weymouth, Diemer, Jensen, Skinner, Mills; Capacity: 280-2080 ML/d; average flocculation time: 6-30 min; avg sedimentation time: 45-126 min; filter media: 30-50cm coal and 20-30 cm sand; actual filtration rates ranged from : 1.1-2. to 2.4-5.2 mm/s; state project water: ranged from 17-43% to 100%; turbidity range: influents 0.8-7.5 ntu, effluents 0.08-0.34 ntu
System Type Design	Water treatment process: rapid mixing, flocculation, sedimentation, filtration, clear well; chemical treatment included pre-, intermediate, and post chlorination, coagulation with alum and cationic polymer and pH stabilization with caustic soda.
Sampling Frequency and Sampling Details	each composite sample was a collection of seven 140-mL grab samples taken in 4-hour intervals over 24 hours.; Composite samples collected in cleaned plastic bottles and stored under refrigeration prior to analysis.
Test Temperature	Not reported
Results Details	Mean removal: Weymouth 99.89%, Diemer 94.74%, Jensen NR, Skinner NR, Mills 99.33%; under optimized conditions >90% removal was observed in Weymouth; less effective and more variable removals observed in Diemer; removal efficiency was not quantifiable in Jensen due to effluent values below detection levels; poor performance observed in Skinner; removal rates were among highest recorded in Mills
Analytical Method and Analytical Details	modified Jaffe wick technique (membrane filtration followed by transmission electron microscopy); detection limits ranged from 0.15 to 11 MFL for source waters and 0.057 to 1.1 MFL for treated waters; limits were dependent on sample turbidities
Transformation Products, Statistics, and Kinetics	Not reported; Not reported; Not reported
Reference Substance and Reference Substance Results	Not reported; Not reported

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified clearly.
	Metric 2:	Test Substance Purity	N/A	This metric is not applicable to this type of study.
Domain 2: Test Design				
	Metric 3:	Study Controls	N/A	This metric is not applicable to this type of study.
	Metric 4:	Test Substance Stability	N/A	This metric is not applicable to this type of study.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	N/A	This metric is not applicable to this type of study.

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Study Citation:	Mcguire, M. J., Bowers, A. E., Bowers, D. A. (1983). OPTIMIZING LARGE-SCALE WATER-TREATMENT PLANTS FOR ASBESTOS-FIBER REMOVAL. Journal of the American Water Works Association 75(7):364-370.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3581621

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 6:	Testing Conditions	High	Conditions were reported.
	Metric 7:	Testing Consistency	N/A	This metric is not applicable to this type of study.
	Metric 8:	System Type and Design	High	System type and design were reported.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	This metric is not applicable to this type of study.
	Metric 10:	Sampling Methods	N/A	This metric is not applicable to this type of study.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methods addressed the data.
	Metric 12:	Test Substance Purity	High	Sampling methods were reported and appropriate.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	N/A	This metric is not applicable to this type of study.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	This metric is not applicable to this type of study.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	High	Data reporting was acceptable.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	This metric is not applicable to this type of study.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	Results are reasonable and compared over multiple treatment plants.
	Metric 18:	QSAR Models	N/A	This metric is not applicable to this type of study.

Overall Quality Determination High

Study Citation:	NICNAS, (1999). Chrysotile asbestos: priority exisiting chemical no. 9.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3978350

EXTRACTION

Parameter	Data
CASRN and Test Material	12001-29-5; Chrysotile
Confidentiality, Type, Guideline	Not Reported; Not Reported; Not Reported
Solvent, Reactivity, Storage, Stability	Not Reported; Not Reported; Not Reported; Not Reported
Radiolabel, Source, State, Purity	Not Reported; Not Reported; Not Reported; Not Reported
Test Method Details, Test Condition Details, and Test Consistency Details	Chrysotile is subject to thermal decomposition at elevated temperatures.; Not Reported; Not Reported
System Type Design	Not Reported
Sampling Frequency and Sampling Details	Not Reported; Not Reported
Test Temperature	600-780ºC and 800-850ºC
Results Details	This thermal decomposition is a two stage reaction consisting first of a dehydroxylation phase and then a structure phase change. Dehydroxylation or the loss of water occurs at 600-780ºC. At 800-850ºC the anhydride breaks down to forsterite and silica. These reactions are irreversible.
Analytical Method and Analytical Details	Not Reported; Not Reported
Transformation Products, Statistics, and Kinetics	forsterite and silica; Not Reported; Not Reported
Reference Substance and Reference Substance Results	Not Reported; Not Reported

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	Test substance was identified by name.
	Metric 2:	Test Substance Purity	Medium	The test substance source and purity were not reported in the secondary source.
Domain 2: Test Design				
	Metric 3:	Study Controls	N/A	Rating of this factor is not applicable to this kind of information.
	Metric 4:	Test Substance Stability	N/A	Rating of this factor is not applicable to this kind of information.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	Medium	Test method details were not reported in the secondary source however there is no indication that the methodology for producing the information was biased towards a particular outcome.
	Metric 6:	Testing Conditions	Medium	Testing conditions are unknown but are likely to be appropriate based on the data's inclusion in a peer- reviewed/recognized database or other secondary source.
	Metric 7:	Testing Consistency	Medium	Testing consistency is unknown but are likely to be appropriate based on the data's inclusion in a peer- reviewed/recognized database or other secondary source.
	Metric 8:	System Type and Design	N/A	Rating of this factor is not applicable to this kind of information.

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Study Citation:	NICNAS, (1999). Chrysotile asbestos: priority exisiting chemical no. 9.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3978350

Domain		Metric	EVALUATION Rating	Comments
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	Rating of this factor is not applicable to this kind of information.
	Metric 10:	Sampling Methods	N/A	Rating of this factor is not applicable to this kind of information.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Medium	The outcome assessment methodology is unknown but is likely to be appropriate based on the data's inclusion in a peer- reviewed/recognized database or other secondary source.
	Metric 12:	Test Substance Purity	Medium	Sampling methodology is unknown is unknown but is likely to be appropriate based on the data's inclusion in a peer- reviewed/recognized database or other secondary source.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Medium	Sources of variability and uncertainty were not reported in the secondary source.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	Rating of this factor is not applicable to this kind of information.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	Limited data is reported in the secondary source but study data are likely to be appropriate based on the data's inclusion in a peer- reviewed/recognized database or other secondary source.
	Metric 16:	Statistical Methods and Kinetic Calculations	Medium	No statistical methods or kinetic calculations were reported in the secondary source.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Medium	The results are reasonable based on the data's inclusion in a peer- reviewed/recognized database or other secondary source.
	Metric 18:	QSAR Models	N/A	Rating of this factor is not applicable to this kind of information.

Overall Quality Determination — Medium

* Related References: cited to HSDB, 1998

Study Citation:	Obmiński, A. (2021). Asbestos waste recycling using the microwave technique – Benefits and risks.
OECD Harmonized Template:	Miscellaneous
HERO ID:	10190620

EXTRACTION

Parameter	Data
CASRN and Test Material	12001-29-5; asbestos waste
Confidentiality, Type, Guideline	none; experimental; experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; soil contaminated with asbestos-cement products; solid; NR Notes: asbestos content <0.05% (0.1-0.001%); fibers separated from soil identified as chrysotile via roasting at 550-620°C.
Test Method Details, Test Condition Details, and Test Consistency Details	The decomposition of trace asbestos in asbestos-containing waste material was assessed via heating in microwave thermal treatment (MTT) reactors.; Fluxes reaching 700–1000°C; Samples of asbestos-cement waste used included shredded material, containing pieces of asbestos-cement boards Ø 10–20 mm and fragments of asbestos-cement boards, ca 150–250 cm2.
System Type Design	microwave thermal treatment reactor
Sampling Frequency and Sampling Details	not reported; not reported
Test Temperature	700–1000°C
Results Details	various degrees of fiber destruction were observed; at higher temperature observations of changes in morphology increases; MTT does not fully decompose all fibers present in waste, as the composition of fibers after MTT at 1000C is similar to the chrysotile or crocidolite asbestos fibres in the original sample of asbestos-cement.
Analytical Method and Analytical Details	Optical Microscopy and SEM–EDS; Analytical methods used to identification of asbestos in waste samples and compare treated samples and degree of destruction.
Transformation Products, Statistics, and Kinetics	elemental analysis reported for 5 samples compared to samples of crocidolite and chrysotile; not reported; not reported
Reference Substance and Reference Substance Results	crocidolite and chrysotile; elemental analysis reported

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	Low	The test substance was not a specific asbestos, but a soil material containing waste asbestos with less than 0.05% asbestos.
	Metric 2:	Test Substance Purity	Medium	Source was not stated; chemical composition of waste material was reported.
Domain 2: Test Design				
	Metric 3:	Study Controls	N/A	The study did not require concurrent control groups.
	Metric 4:	Test Substance Stability	High	The test substance preparation methods were reported.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	Medium	Experimental process for asbestos destruction.
	Metric 6:	Testing Conditions	High	Test conditions were reported.
	Metric 7:	Testing Consistency	High	Test conditions were consistent.
	Metric 8:	System Type and Design	High	The system type and design were described.

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Study Citation:	Obmiński, A. (2021). Asbestos waste recycling using the microwave technique – Benefits and risks.
OECD Harmonized Template:	Miscellaneous
HERO ID:	10190620

			EVALUATION	
Domain		Metric	Rating	Comments
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this study.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Medium	There were minor differences between the reported results and the intended outcome of interest.
	Metric 12:	Test Substance Purity	High	Sampling methods were acceptable for this study.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	N/A	The metric is not applicable to this study.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this study.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	High	Data reporting was acceptable.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	The metric is not applicable to this study.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Medium	The study results were reasonable.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study.
Overall Quality Determination			**High**	

Study Citation:	Osada, M., Takamiya, K.,en, Manako, K., Noguchi, M., Sakai, S. I. (2013). Demonstration study of high temperature melting for asbestos-containing waste (ACW). Journal of Material Cycles and Waste Management 15(1):25-36.
OECD Harmonized Template:	Miscellaneous
HERO ID:	2663454

EXTRACTION

Parameter	Data
CASRN and Test Material	12001-29-5; Asbestos-containing waste (ACW)
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; NR; Slate material in an industrial produced form; preformed insulation; Slate main constituents: cement 40%, calcium carbonate 41.5%, chrysotile 6.5%; preformed insulation main constituent: calcium silicate with 1-5% amosite
Test Method Details, Test Condition Details, and Test Consistency Details	ACW was mixed with primary waste and treated in a shaft type of gasification and melting furnace demonstration test facility.; Mixed ratios of ACW: 5.2-14.1%; mixed waste of ASR (automobile shredder) and MSW (municipal solid waste from business activities); Treatment: 120 t/day, 18h test duration; exhaust gas volume: 80,730-87,577 Nm3 -wet/h; Tests conducted for 4 consecutive days
System Type Design	Shaft furnac708e test facility: gasification and melting furnace with combustion chamber (CC), boiler, temperature reduction tower, bag filter (BF), and catalyst reaction tower; a HEPA filter was used to prevent discharge of fibers into the atmosphere
Sampling Frequency and Sampling Details	Data evaluation was targeted on a 12 hour period of each day, during which the furnace condition was presumed to be in a steady-state.; Asbestos concentration measured in exhaust gas at inlet and outlet of BF and outlet of HEPA filter; four discharged solids were measured for asbestos (slag, metal, fly ash, CC ash); asbestos concentration in air also monitored
Test Temperature	Melting temperature target 1500C (exceeded target 1568-1696C), combustion chamber target 850-900C, exhaust gas measured in the combustion chamber = 899-906C and exhaust gas measured in the HEPA filter inlet = 183-186C
Results Details	Not Reported
Analytical Method and Analytical Details	Analysis of asbestos concentration in asbestos-containing waste by X-ray diffraction method; concentration in exhaust gas and ambient air by phase contrast microscopy-membrane filter method JIS K 3850-1; Slag, metal, fly ash, and CC ash, analyses by dispersion staining method with phase contrastmicroscope and X-ray diffraction and TEM
Transformation Products, Statistics, and Kinetics	Not reported; Not reported; Not reported
Reference Substance and Reference Substance Results	ASR, MSW and industrial waste without ACW mix; Asbestos was not detected in treated materials

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Test Substance			
Metric 1:	Test Substance Identity	High	The test substance was identified by name.
Metric 2:	Test Substance Purity	High	The test substance source was reported.
Domain 2: Test Design			
Metric 3:	Study Controls	N/A	The metric is not applicable to this study type.
Metric 4:	Test Substance Stability	N/A	The metric is not applicable to this study type.
Domain 3: Test Conditions			
Metric 5:	Test Method Suitability	High	The test method was suitable for the test substance.
Metric 6:	Testing Conditions	High	Testing conditions were reported.

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Study Citation:	Osada, M., Takamiya, K.,en, Manako, K., Noguchi, M., Sakai, S. I. (2013). Demonstration study of high temperature melting for asbestos-containing waste (ACW). Journal of Material Cycles and Waste Management 15(1):25-36.
OECD Harmonized Template:	Miscellaneous
HERO ID:	2663454

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 7:	Testing Consistency	High	Test conditions were consistent.
	Metric 8:	System Type and Design	High	The system type and design was appropriate.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology addressed the intended outcome of interest.
	Metric 12:	Test Substance Purity	High	Sampling methods were reported.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Medium	This metric met the criteria for high confidence as expected for this type of study.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	The results were reasonable based on the method.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

Overall Quality Determination High

Study Citation:	Ottaviani, M., Marconi, A., Magnatti, P. (1986). Asbestos Fiber Removal During Effluent Wastewater Treatment. Pilot Plant Evaluation. Studies in Environmental Science 29:335-343.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6899950

EXTRACTION

Parameter	Data
CASRN and Test Material	Not reported; Chrysotile
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	tap (drinking) water; NR; NR; NR
Radiolabel, Source, State, Purity	NR; NIEHS; suspension in tap water; fibre content: 0.05 million fibers per liter (MFL); NR
Test Method Details, Test Condition Details, and Test Consistency Details	Pretreatment: coagulation and sedimentation, and filtration (sand filter: 5.2 cm column, 9.0 cm depth. 0.500 mm effective size; MgO filter: 5.2 cm column, 9.0 cm depth. 0.500 mm effective size); Asbestos levels in pre-treated suspensions: 5E10 to 5E12 f/L; suspension consisted of 50 mg chrysotile ultrasonically dispersed in 5 L pre-filtered water; There was a continuous change in asbestos fiber concentration in feed water and therefore no comparison term
System Type Design	Well agitated suspension 10L tank, 8L flocculation tank (20 mg/L alum, pH 6.5), 35L sedimentation tank (120 min retention time), sand and MgO filter columns. Operation flow rate 240 mL/min.
Sampling Frequency and Sampling Details	Not reported; Samples collected once steady state was established; samples collected at different stages of flocculation and filtration and analyzed via SEM and PCLM.
Test Temperature	Not reported
Results Details	Asbestos removal: from the feed water = 3E9 to 4E9 f/L, post sediment = 1.9E6 to 2.0E6 f/L, sand filter = 0.5E6 to 0.6E6 f/L, MgO filter = 0.2E6 to 0.3E6 f/L
Analytical Method and Analytical Details	Fiber counts: Scanning electron microscopy (SEM) and high magnification phase-contrast light microscopy (PCLM); backgrounds counts were performed on blanks and subtracted appropriately when 10% of sample counts was exceeded; Minimum detectable concentration of fibers varied with volume and background particles and the detection limit for SEM counts ranged between 0.03 - 0.08 MFL
Transformation Products, Statistics, and Kinetics	Not reported; Data reported represent only values that gave a significant difference between raw feed and post-sedimentation water; in some data this was not considered significant.; Not reported
Reference Substance and Reference Substance Results	Not reported; Not reported

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Test Substance			
Metric 1:	Test Substance Identity	High	The test substance was identified definitively.
Metric 2:	Test Substance Purity	Medium	The test substance source was reported; composition/purity was not reported.
Domain 2: Test Design			
Metric 3:	Study Controls	Low	Controls were not included.
Metric 4:	Test Substance Stability	N/A	This metric is not applicable to this type of study.
Domain 3: Test Conditions			
Metric 5:	Test Method Suitability	Medium	Pilot plant study.
Metric 6:	Testing Conditions	High	Testing conditions were reported.

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Study Citation:	Ottaviani, M., Marconi, A., Magnatti, P. (1986). Asbestos Fiber Removal During Effluent Wastewater Treatment. Pilot Plant Evaluation. Studies in Environmental Science 29:335-343.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6899950

		EVALUATION		
Domain		Metric	Rating	Comments
	Metric 7:	Testing Consistency	Uninformative	Variable concentrations in raw water; concentrations not reported.
	Metric 8:	System Type and Design	High	The system and design were reported and acceptable.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	This metric is not applicable to this type of study.
	Metric 10:	Sampling Methods	N/A	This metric is not applicable to this type of study.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Uninformative	A large variability of the analytical methods used for counting fibres.
	Metric 12:	Test Substance Purity	High	Sampling methods were acceptable.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Uninformative	Variable concentrations in raw water; concentrations not reported.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	This metric is not applicable to this type of study.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Uninformative	Initial concentrations, mass balance and overall removal efficiencies were not reported.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	This metric is not applicable to this type of study.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Uninformative	Due to limited or lack of information the results are unusable.
	Metric 18:	QSAR Models	N/A	This metric is not applicable to this type of study.

Overall Quality Determination — Uninformative

Study Citation:	Poiroux, R., Rollin, M. (1996). High temperature treatment of waste: From laboratories to the industrial stage. Pure and Applied Chemistry 68(5):1035-1040.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6874604

EXTRACTION

Parameter	Data
CASRN and Test Material	not reported; Asbestos
Confidentiality, Type, Guideline	No; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; asbestos wastes from dismantling of Arjuzanx plant and EDF power plants; typically a mixture of rubbish and metallic beams polluted by asbestos; Not Reported
Test Method Details, Test Condition Details, and Test Consistency Details	A movable asbestos waste treatment facility based on vitrification with a high temperature plasma torch; capacity: 1 ton/hour, continuous 24h operation.; Movable system – 5 main units: furnace with post-combustion chamber (1200-4000°C), plasma system (electric power: 1750 kW, thermal effective power: 1435 kW), fumes discharge treatment unit (temp: 200°C), and a monitoring control panel.; not reported
System Type Design	Mobile waste treatment plant
Sampling Frequency and Sampling Details	not reported; not reported
Test Temperature	1200-4000°C
Results Details	Waste treatment resulted in a vitrified product which was considered stable and marketable; volume of waste reduced to 1/20th of its original volume.
Analytical Method and Analytical Details	not reported; not reported
Transformation Products, Statistics, and Kinetics	not reported; not reported; not reported
Reference Substance and Reference Substance Results	not reported; not reported

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Test Substance			
Metric 1:	Test Substance Identity	Medium	The test substance was identified as a general asbestos waste.
Metric 2:	Test Substance Purity	N/A	This metric is not applicable to this study type.
Domain 2: Test Design			
Metric 3:	Study Controls	N/A	This metric is not applicable to this study type.
Metric 4:	Test Substance Stability	N/A	This metric is not applicable to this study type.
Domain 3: Test Conditions			
Metric 5:	Test Method Suitability	High	Method was reported.
Metric 6:	Testing Conditions	Medium	Limited detail.
Metric 7:	Testing Consistency	N/A	This metric is not applicable to this study type.
Metric 8:	System Type and Design	Low	Experimental system and design.
Domain 4: Test Organisms			

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Study Citation:	Poiroux, R., Rollin, M. (1996). High temperature treatment of waste: From laboratories to the industrial stage. Pure and Applied Chemistry 68(5):1035-1040.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6874604

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 9:	Outcome Assessment Methodology	N/A	This metric is not applicable to this study type.
	Metric 10:	Sampling Methods	N/A	This metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Uninformative	Incomplete reporting of the assessment method and intended outcome of interest.
	Metric 12:	Test Substance Purity	N/A	This metric is not applicable to this study type.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	N/A	This metric is not applicable to this study type.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	This metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Uninformative	Incineration removal details incomplete.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	This metric is not applicable to this study type.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Low	Due to limited information, evaluation of the reasonableness of the study results was not possible.
	Metric 18:	QSAR Models	N/A	This metric is not applicable to this study type.

Overall Quality Determination — Uninformative

Study Citation:	Porcu, M., Orru, R., Cincotti, A., Cao, G. C. (2005). Self-propagating reactions for environmental protection: Treatment of wastes containing asbestos. Industrial and Engineering Chemistry Research 44(1):85-91.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3581347

EXTRACTION

Parameter	Data
CASRN and Test Material	12001-29-5; Asbestos-containing waste material
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; millboard product used for heat insulation containing about 85 wt % of chrysotile; NR; Test materials were 40-70 wt% chrysotile; 20.6-41.2% ferric oxide; 9.4-18.8% magnesium
Test Method Details, Test Condition Details, and Test Consistency Details	thermochemical method based on self-propagating high-temperature thermite reactions; reactions initiated using a tungsten coil connected to the power supply programmed to produce an energy pulse at 20V for ca. 4s and turn off as soon as reaction began; Not reported; Mixtures evaluated were 40, 50, 60, and 70% ACM, with 41.2, 34.3, 27.4, and 20.6% ferric oxide, and 18.8, 15.7, 12.3, and 9.4% magnesium respectively.
System Type Design	Stainless steel reaction chamber filled with argon; temperature during reaction and average velocity of the combustion wave measured using thermocouples in the reaction mixture
Sampling Frequency and Sampling Details	Not reported; Not reported
Test Temperature	Not reported
Results Details	Results for 50%ACM indicate the chrysotile reflections observed in the XRD pattern related to the initial material disappear after treatment; SEM micrographs of the starting mixture and product after treatment were included in document and reported to be representative of all mixture scenarios tested; maintenance of self-propagating character of the system was optimal when ACM content was equal to or below 60 wt%.
Analytical Method and Analytical Details	X-ray diffraction, scanning electron microscopy and electron dispersive spectroscopy; Characterization of samples before and aftertreatment verified compositional and microstructural changes
Transformation Products, Statistics, and Kinetics	Material changed both chemically and structurally; Not applicable; Activation energy o the self-propagating reaction with ACM = 58.9 kJ/mol
Reference Substance and Reference Substance Results	Not applicable; Not applicable

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified by name.
	Metric 2:	Test Substance Purity	High	The source of the material was reported with composition details.
Domain 2: Test Design				
	Metric 3:	Study Controls	High	Controls were included.
	Metric 4:	Test Substance Stability	N/A	This metric is not applicable to this type of study.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	Medium	Experimental method; not a fully operating industrial treatment system.
	Metric 6:	Testing Conditions	Low	Testing condition details, including temperatures, were limited or not reported.
	Metric 7:	Testing Consistency	High	Testing was consistent.

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Study Citation:	Porcu, M., Orru, R., Cincotti, A., Cao, G. C. (2005). Self-propagating reactions for environmental protection: Treatment of wastes containing asbestos. Industrial and Engineering Chemistry Research 44(1):85-91.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3581347

		EVALUATION		
Domain	Metric		Rating	Comments
	Metric 8:	System Type and Design	High	The system and design were appropriate.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	This metric is not applicable to this type of study.
	Metric 10:	Sampling Methods	N/A	This metric is not applicable to this type of study.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Medium	The methodology was appropriate
	Metric 12:	Test Substance Purity	N/A	This metric is not applicable to this type of study.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	N/A	This metric is not applicable to this type of study.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	This metric is not applicable to this type of study.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	Data reporting was limited; mass balance was not reported.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	Calculations were described and appropriate.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Medium	The study results were reasonable.
	Metric 18:	QSAR Models	N/A	This metric is not applicable to this type of study.

Overall Quality Determination — High

Study Citation:	Promentilla, M. A. B., Peralta, G. L. (2003). An evaluation of landfill disposal of asbestos-containing waste and geothermal residues within a risk-assessment framework. Journal of Material Cycles and Waste Management 5(1):13-21.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6896703

EXTRACTION

Parameter	**Data**
CASRN and Test Material	NR; chrysotile
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; asbestos containing wastes; NR; NR
Test Method Details, Test Condition Details, and Test Consistency Details	stereomicroscopic and petrographic observations; Significant erosion and disturbance, such as excavation of the site, may exposethe asbestos-containing waste but otherwise the landfill disposal has no potentially significant exposure pathways; NR
System Type Design	NR
Sampling Frequency and Sampling Details	NR; asbestos fibers are tightly bound in the calcite matrix
Test Temperature	NR
Results Details	dominant asbestiform phase in the samples suspected of containing asbestos waste is chrysotile; None of the possible exposure pathways is potentially significant, since there is a minimal chance of the fibers being released as long as the matrix material is intact and sufficient cover is provided
Analytical Method and Analytical Details	NR; NR
Transformation Products, Statistics, and Kinetics	NR; NR; NR
Reference Substance and Reference Substance Results	NR; NR

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified definitively.
	Metric 2:	Test Substance Purity	Medium	The test substance source was reported but no purity information was reported.
Domain 2: Test Design				
	Metric 3:	Study Controls	N/A	The study did not require concurrent control groups.
	Metric 4:	Test Substance Stability	Medium	The test substance stability, homogeneity, preparation or storage conditions were not reported; however, these factors were not likely to influence the test substance or were not likely to have a substantial impact on study results.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	Low	The test method was suitable for the test substance however no quantitative data was reported.
	Metric 6:	Testing Conditions	Medium	There were reported deviations or omissions in testing conditions.
	Metric 7:	Testing Consistency	N/A	The metric is not applicable to this study type.

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Study Citation:	Promentilla, M. A. B., Peralta, G. L. (2003). An evaluation of landfill disposal of asbestos-containing waste and geothermal residues within a risk-assessment framework. Journal of Material Cycles and Waste Management 5(1):13-21.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6896703

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 8:	System Type and Design	N/A	The metric is not applicable to this study type.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Medium	There was incomplete reporting of outcome assessment methods; however, such differences or absence of details were not likely to be severe or have a substantial impact on the study results.
	Metric 12:	Test Substance Purity	Low	Details regarding sampling methods of the outcome(s) were not fully reported, and the omissions were likely to have a substantial impact on study results.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Low	Sources of variability and uncertainty in the measurements and statistical techniques and between study groups were not considered or accounted for in data evaluation resulting in some uncertainty.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Low	Omissions in data reporting were likely to have a substantial impact on study results.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	The metric is not applicable to this study type.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Low	Due to limited information, evaluation of the reasonableness of the study results was not possible.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

Overall Quality Determination — Low

Study Citation:	Sakai, S., Takatsuki, H., Hiraoka, M., Tsunemi, T. (1991). Sludge melting process with hazardous asbestos wastes. Water Science and Technology 23(10-12):2029-2037.
OECD Harmonized Template:	Miscellaneous
HERO ID:	1237202

EXTRACTION

Parameter	Data
CASRN and Test Material	12001-29-5; Not Reported
Confidentiality, Type, Guideline	No; Co-melting of sewage sludge and asbestos waste; Co-melting of sewage sludge and asbestos waste
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; waste generated from sprayed-on asbestos removal at Kyoto University; chrysotile waste; a mixture of asbestos, fibrous glass, cementitious binder and amended water; NR Notes: NR
Test Method Details, Test Condition Details, and Test Consistency Details	A mix of lime-added and polymer-added sewage sludge was co-melted with a sprayed-on asbestos waste in a laboratory scale furnace.; Sewage sludge (45% H2O) at 25.0 kg/h and chrysotile waste (34% H2O) at 4.7 kg/h were pre-mixed into cylindrical pellets and fed into furnace and scrubber; Not reported
System Type Design	Laboratory furnace
Sampling Frequency and Sampling Details	Not reported; Not reported
Test Temperature	3 stages: 760Â°C, 1060Â°C, 1640Â°C
Results Details	Original chrysotile peaks disappeared in melted slag; Fibrous forms in waste disappeared in melted slag; it was suggested that at 800Â°C decomposition of chyrsotile proceeds according to 2Mg3Si2O5(OH)4 -> 3Mg2SiO4 + SiO2 + 4H2O
Analytical Method and Analytical Details	X-ray diffraction; Original chrysotile peaks: 2-theta = 12Â°, 24Â°, 37Â°, 60Â°
Transformation Products, Statistics, and Kinetics	Not reported; Not reported; Not reported
Reference Substance and Reference Substance Results	Not reported; Not reported

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified by chemical name.
	Metric 2:	Test Substance Purity	High	Source of the test material was reported.
Domain 2: Test Design				
	Metric 3:	Study Controls	N/A	Experimental control groups are not required for this type of study.
	Metric 4:	Test Substance Stability	Medium	Test substance stability, homogeneity, preparation or storage conditions were not reported, but is not likely to impact the results of the study.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	The test method was suitable.
	Metric 6:	Testing Conditions	Medium	Temperature was reported; duration/retention time not reported.
	Metric 7:	Testing Consistency	N/A	The metric is not applicable to this study type.
	Metric 8:	System Type and Design	N/A	Not applicable to this study type.

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Study Citation:	Sakai, S., Takatsuki, H., Hiraoka, M., Tsunemi, T. (1991). Sludge melting process with hazardous asbestos wastes. Water Science and Technology 23(10-12):2029-2037.
OECD Harmonized Template:	Miscellaneous
HERO ID:	1237202

		EVALUATION		
Domain		Metric	Rating	Comments
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Low	The outcome assessment methodology addressed the intended outcome of interest qualitatively. No quantitative results were reported.
	Metric 12:	Test Substance Purity	N/A	The metric is not applicable to this study type.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	N/A	The metric is not applicable to this study type.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	Analytical detail, mass balance, quantitative data not reported.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	The metric is not applicable to this study type.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Low	Due to limited information, evaluation of the reasonableness of the study results was not possible.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

Overall Quality Determination — Low

Study Citation:	Schmitt, R. P., Lindsten, D. C., Shannon, T. F. (1977). DECONTAMINATING LAKE-SUPERIOR OF ASBESTOS FIBERS. Environmental Science and Technology 11(5):462-465.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3583145

EXTRACTION

Parameter	**Data**
CASRN and Test Material	1332-21-4; Asbestos
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; Lake Superior water; NR; NR
Test Method Details, Test Condition Details, and Test Consistency Details	U.S. Army Water Purification Equipment (ERDLator Unit) was used to remove asbestos fibers from Lake Superior water.; pH: 7.8; turbidity in raw water (JTU): 1.50; turbidity in effluent water (JTU): 0.22.; Not reported
System Type Design	The optimized system operation was coagulation with addition of 2 ppm cationic polyelectrolyte (added in ERDLator water well), followed by filtration with 0.4 lbs of celite 535 precoat (Johns Manville) and 28 ppm body feed (Hyflo, Johns Manville Co.)
Sampling Frequency and Sampling Details	Two; 4.75 hour run time
Test Temperature	Not reported
Results Details	Fiber concentration (10^6 fibers/L): Analysis 1: Raw: 2.0; Effluent: 0. Analysis 2: Raw: 0.3; Effluent: 0.
Analytical Method and Analytical Details	Transmission electron microscope; Not reported
Transformation Products, Statistics, and Kinetics	Not Reported; Not reported; Not reported
Reference Substance and Reference Substance Results	Not reported; Not Reported

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified using common nomenclature.
	Metric 2:	Test Substance Purity	High	The test substance was obtained from field samples.
Domain 2: Test Design				
	Metric 3:	Study Controls	Medium	The use of controls was not reported; however, the omission is unlikely to have a substantial impact on the study results.
	Metric 4:	Test Substance Stability	N/A	The metric is not applicable to the study type.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	The test method was suitable for the test substance.
	Metric 6:	Testing Conditions	High	The testing conditions were reported and appropriate.
	Metric 7:	Testing Consistency	High	The testing conditions were reported for each operational mode.
	Metric 8:	System Type and Design	N/A	The metric is not applicable to the study type.
Domain 4: Test Organisms				

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Study Citation:	Schmitt, R. P., Lindsten, D. C., Shannon, T. F. (1977). DECONTAMINATING LAKE-SUPERIOR OF ASBESTOS FIBERS. Environmental Science and Technology 11(5):462-465.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3583145

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to the study type.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to the study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology addressed the intended outcome of interest.
	Metric 12:	Test Substance Purity	Medium	Some details regarding the sampling methods were not reported; however, the omissions are unlikely to have a substantial impact on the study results.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Low	Uncertainty was not reported which may have an impact on the study results.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to the study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Low	Some details regarding the analytical method were not reported which may have an impact on the study results.
	Metric 16:	Statistical Methods and Kinetic Calculations	Low	Statistical analysis was not conducted.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Low	Due to limited information the reasonableness of the study results could not be evaluated.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to the study type.

Overall Quality Determination Medium

Study Citation:	Schreier, H., Lavkulich, L. (2015). Cumulative effects of the transport of asbestos-rich serpentine sediments in the trans-boundary Sumas Watershed in Washington State and British Columbia. Canadian Water Resources Journal 40(3):262-271.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3583161

EXTRACTION

Parameter	Data
CASRN and Test Material	12001-29-5; Asbestos
Confidentiality, Type, Guideline	No; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; Sediments rich in chrysotile asbestos; Serpentinitic sediments; Not specified; asbestos-rich sediments with high Mg, Ni, and Cr with alkaline pH and low Ca and Zn Notes: natural landslide in the Sumas River Watershed in Washington State
Test Method Details, Test Condition Details, and Test Consistency Details	Bed- and suspended sediment samples collected along the Sumas River; samples were wet sieved to obtain a < 63 μm fraction (silt and clay particles) containing the largest concentration of asbestos fibers.; Characteristics measured at 400, 1200, and 2900 m from the landslide, pH was 8.30, 8.25, and 7.40, respectively, spec. conductivity was 118.2, 119.3 and 170.2 µS/cm, respectively, organic carbon in sediment was 2.98%, 3.96%, and 3.89%, respectively; Mg in sediment (mg/kg) 165822, 157262, and 153812, respectively; Ni in sediment (mg/kg) 1801, 1791, and 1725, respectively.; not applicable
System Type Design	monitoring study of stream sediments located near a natural landslide in the Sumas River Watershed
Sampling Frequency and Sampling Details	Samples collected in 1994, 2008, 2009, 2010, 2011, 2012 and 2014; Suspended and deposited sediments collected along the rain-fed Sumas River using a time-integrated suspended sediment sampler.
Test Temperature	not reported; ambient
Results Details	Chemical characteristics of the sediments suggest sediment transport downstream occurs in a pulsed manner, mainly during storm events and involves suspension, deposition, and resuspension; settling appeared faster near the landslide compared to downstream. The majority of the < 63 μm sediment fraction, at the lowest station, was found to be suspended after 5 minutes in the water column; sediment transported downstream is affected by water chemistry and organic content which may also play a role in re-suspension of sediments.
Analytical Method and Analytical Details	agate mortar and pestle was used to break apart large aggregates; sediments were digested using the aqua regia method USEPA Ecology and Environment Inc. 1994, and analyzed for trace metals using an inductively coupled argon emission spectrograph. Filtered samples were analyzed using inductively coupled plasma – atomic emission spectroscopy.; not reported
Transformation Products, Statistics, and Kinetics	not reported; not reported; not applicable
Reference Substance and Reference Substance Results	not applicable; not applicable

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified.
	Metric 2:	Test Substance Purity	High	The source was reported.
Domain 2: Test Design				
	Metric 3:	Study Controls	N/A	The metric is not applicable to this type of study.
	Metric 4:	Test Substance Stability	N/A	The metric is not applicable to this type of study.
Domain 3: Test Conditions				

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Study Citation:	Schreier, H., Lavkulich, L. (2015). Cumulative effects of the transport of asbestos-rich serpentine sediments in the trans-boundary Sumas Watershed in Washington State and British Columbia. Canadian Water Resources Journal 40(3):262-271.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3583161

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 5:	Test Method Suitability	N/A	The metric is not applicable to this type of study.
	Metric 6:	Testing Conditions	Medium	Field study; sediment and water characteristics reported, temperatures not reported.
	Metric 7:	Testing Consistency	N/A	The metric is not applicable to this type of study.
	Metric 8:	System Type and Design	N/A	Field study; the metric is not applicable to this type of study.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this type of study.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this type of study.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Medium	Sediment settling rates not specifically reported; however, settling rate indicators were reported.
	Metric 12:	Test Substance Purity	High	Sampling was appropriate.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	N/A	The metric is not applicable to this type of study.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this type of study.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	Detection limits were not reported.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	The metric is not applicable to this type of study.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Medium	Study results were reasonable; however, specific rates were not reported.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this type of study.

Overall Quality Determination — High

Study Citation:	Schreier, H., Omueti, J. A., Lavkulich, L. M. (1987). Weathering processes of asbestos-rich serpentinitic sediments. Soil Science Society of America Journal 51(4):993-999.
OECD Harmonized Template:	Miscellaneous
HERO ID:	1917037

EXTRACTION

Parameter	Data
CASRN and Test Material	Not reported; Asbestos
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; Asbestos rich sediment from an exposed rock formation; NR; NR Notes: NR
Test Method Details, Test Condition Details, and Test Consistency Details	Three asbestos rich sediment samples and one serpentine bedrock sample underwent oxalic acid and citric acid leaching. Samples were first filtered through a 0.15mm filter, and magnetic/non-magnetic fractions were created using a hand magnet.; Samples were constantly shaken during leaching; Not reported
System Type Design	Original, magnetic, and non-magnetic fractions were leached in water, 0.025M oxalic acid, and 0.017M citric acid solution for 10 d at room temperature. After leaching, samples were filtered, washed with 25mL DI water, and dried.
Sampling Frequency and Sampling Details	Not reported; Not reported
Test Temperature	Not reported
Results Details	ICPS results showed citric acid was slightly more effective at removing most metals from the sediment samples than oxalic acid; however, EDX analysis of individual fibers showed Mg/Si ratios were reduced from 0.68-0.69 to 0.07 by oxalic acid and only to 0.38 by citric acid.
Analytical Method and Analytical Details	Energy dispersive x-ray analysis (EDX) and scanning and transmission electron microscopy (STEM) for individual fiber analysis. Inductively coupled plasma spectrometry (ICPS) for total elemental analysis; Not reported
Transformation Products, Statistics, and Kinetics	Not reported; Not reported; Not reported
Reference Substance and Reference Substance Results	Chrysotile asbestos from the International Union against Cancer (IUCC); Mg/Si ratios were the same in the reference substance as they were in the bedrock, sediment, and water-extracted samples (0.68-0.69).

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 2:	Test Substance Purity	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 2: Test Design				
	Metric 3:	Study Controls	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 4:	Test Substance Stability	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 6:	Testing Conditions	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 7:	Testing Consistency	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 8:	System Type and Design	High	This metric met the criteria for high confidence as expected for this type of study.

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Study Citation:	Schreier, H., Omueti, J. A., Lavkulich, L. M. (1987). Weathering processes of asbestos-rich serpentinitic sediments. Soil Science Society of America Journal 51(4):993-999.
OECD Harmonized Template:	Miscellaneous
HERO ID:	1917037

			EVALUATION	
Domain		Metric	Rating	Comments
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 12:	Test Substance Purity	N/A	The metric is not applicable to this study type.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	This metric met the criteria for high confidence as expected for this type of study.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	This metric met the criteria for high confidence as expected for this type of study.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

Overall Quality Determination — High

Study Citation:	Schreier, H., Taylor, J. (1981). Variations and Mechanisms of Asbestos Fibre Distribution in Stream Water.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6896746

EXTRACTION

Parameter	Data
CASRN and Test Material	Not reported; Asbestos
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; Sumas River; NR; NR
Test Method Details, Test Condition Details, and Test Consistency Details	Two bed-sediment samples were collected in the Sumas River at Nooksack and Swift Creek; samples (32.5 g Nooksack; 19.5 g Swift Creek) were suspended in 1 L asbestos free distilled water and mixed.; Not specified; Asbestos fiber concentration determined in water samples collected from the Sumas River at six stations during 1979-1980 ranged from 4.1E9 to 2.01E13 f/L (Nooksack) and 4.5E7 to 1.9E10 f/L (Swift Creek)
System Type Design	1L measuring cylinders
Sampling Frequency and Sampling Details	Samples collected after 0, 24, 72 and 144 hours.; Water samples were removed from the top 5 cm of the surface.
Test Temperature	Not reported
Results Details	# of fibers at time 0 = ca. 1E12 f/L and after 144 hrs = 1.75E7 to 1.75E8 f/L (Nooksack), # of fibers at time 0 = ca. 1.5E12 f/L and after 144 hrs = 1.5E8 f/L (Swift Creek); suspended fiber size at time = 0 was ca. 16-45 um and 8-9 um at 144 hrs (Nooksack), at time = 0 was ca. 21 um and 10 um at 144 hrs (Swift Creek); general observations: asbestos fibers settle in the absence of turbulence and water movement; rate of settling decreases over time; smaller fibers remain suspended longer than larger fibers
Analytical Method and Analytical Details	Transmission electron microscopy method developed Committee on Asbestos Analysis (1977) a method similar to a US EPA method by Millette (1979); Not reported
Transformation Products, Statistics, and Kinetics	Not reported; Not reported; Not reported
Reference Substance and Reference Substance Results	Replicate sample experiment; adequate agreement obtained in replicate experiments; discrepancy observed after 144 hrs attributed to physical limits of the method.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Test Substance			
Metric 1:	Test Substance Identity	High	The test substance was identified definitively.
Metric 2:	Test Substance Purity	Medium	Source was reported; composition/purity not detailed; analytical reference material not reported.
Domain 2: Test Design			
Metric 3:	Study Controls	High	A control was included.
Metric 4:	Test Substance Stability	N/A	This metric is not applicable to this type of study.
Domain 3: Test Conditions			
Metric 5:	Test Method Suitability	Low	Target chemical concentrations were not specified. General concentrations were reported from a monitoring campaign.
Metric 6:	Testing Conditions	Low	Testing conditions; water quality parameters and sediment characteristics were not reported.

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Study Citation:	Schreier, H., Taylor, J. (1981). Variations and Mechanisms of Asbestos Fibre Distribution in Stream Water.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6896746

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 7:	Testing Consistency	High	Testing was consistent.
	Metric 8:	System Type and Design	Medium	Equilibrium was not reported.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	This metric is not applicable to this type of study.
	Metric 10:	Sampling Methods	N/A	This metric is not applicable to this type of study.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Low	There was incomplete reporting of outcome assessment methods.
	Metric 12:	Test Substance Purity	High	Sampling methods were reported.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	Uninformative	This metric is not applicable to this type of study.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	This metric is not applicable to this type of study.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Uninformative	Initial target chemical concentrations were not specified; mass balance not reported.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	This metric is not applicable to this type of study.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Low	Due to limited information, evaluation of the reasonableness of the study results was not possible.
	Metric 18:	QSAR Models	N/A	This metric is not applicable to this type of study.

Overall Quality Determination — Uninformative

Study Citation:	Speil, S., Leineweber, J. P. (1969). Asbestos minerals in modern technology. Environmental Research 2(3):166-208.
OECD Harmonized Template:	Miscellaneous
HERO ID:	5353620

EXTRACTION

Parameter	Data
CASRN and Test Material	Not reported; Asbestos
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	25% Acid or Caustic solution; Decomposes; NR; Decomposes in caustic or acid
Radiolabel, Source, State, Purity	NR; NR; NR; NR
Test Method Details, Test Condition Details, and Test Consistency Details	Chrysotile, Crocidolite, Amosite, Anthophyllite, Actinolite and Tremolite asbestos fibers dissolved in 25% acid or NaOH solution; Minerals were dissolved in 25% acid or caustic solutions and the percent weight loss was determined after two hours of refluxing; Not reported
System Type Design	Not reported
Sampling Frequency and Sampling Details	Not reported; Not reported
Test Temperature	Not reported
Results Details	Chrysotile: 55.69, 23.42, 55.18, 55.75 and 0.99%; Crocidolite: 4.38, 0.91, 4.37, 3.69 and 1.35%; Amosite: 12.84, 2.63, 11.67, 11.35 and 6.97%; Anthophyllite: 2.66, 0.60, 3.16, 2.73 and 1.22%; Actinolite: 20.31, 12.28, 20.19, 20.38 and 9.25% and Tremolite: 4.77, 1.99, 4.99, 4.58 and 1.80% degradation in 25% HCl, acetic acid, H3PO4, H2SO4 and NaOH, respectively.
Analytical Method and Analytical Details	Not reported; Not reported
Transformation Products, Statistics, and Kinetics	Not reported; Not reported; Not reported
Reference Substance and Reference Substance Results	Not reported; Not reported

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified by chemical name.
	Metric 2:	Test Substance Purity	Medium	The test substance source was not reported nor was the purity stated; however, the omissions were not likely to have a substantial impact on the study results.
Domain 2: Test Design				
	Metric 3:	Study Controls	N/A	The metric is not applicable to this study type.
	Metric 4:	Test Substance Stability	Medium	The test substance stability, homogeneity, preparation or storage conditions were not reported; however, these factors were not likely to influence the test substanceor were not likely to have a substantial impact on study results.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	Medium	Details of the method were only summarized but are not likely to have a substantial impact on the results.
	Metric 6:	Testing Conditions	Uninformative	Testing conditions were not reported and data provided were insufficient to interpret results.

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Study Citation:	Speil, S., Leineweber, J. P. (1969). Asbestos minerals in modern technology. Environmental Research 2(3):166-208.
OECD Harmonized Template:	Miscellaneous
HERO ID:	5353620

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 7:	Testing Consistency	Medium	Some test conditions across samples or study groups were not reported, but these discrepancies were not likely to have a substantial impact on study results.
	Metric 8:	System Type and Design	Uninformative	Details were not reported preventing meaningful interpretation of study results.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Uninformative	Study details were not reported to evaluate methodology.
	Metric 12:	Test Substance Purity	Medium	Details regarding sampling methods of the outcome(s) were not fully reported but were unlikely to have major impact on the results.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	N/A	The metric is not applicable to this study type.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Medium	The target chemical and transformation product(s) concentrations, extraction efficiency, percent recovery, or mass balance were not reported; however, theseomissions were not likely to have a substantial impact on study results.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	The metric is not applicable to this study type.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	Reported values were within expected range.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

Overall Quality Determination — Uninformative

* Related References: Originally reported in Canadian Mining and Metallurgical Bulletin, April, 1951.

Study Citation:	Srivastava, S. K., Ramanathan, A. L. (2018). Assessment of landfills vulnerability on the groundwater quality located near floodplain of the perennial river and simulation of contaminant transport. Modeling Earth Systems and Environment 4(2):729-752.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6895656

EXTRACTION

Parameter	Data
CASRN and Test Material	12001-29-5; chrysotile
Confidentiality, Type, Guideline	No; Monitoring study; Monitoring study
Solvent, Reactivity, Storage, Stability	Not Reported; Not Reported; Not Reported; Not Reported
Radiolabel, Source, State, Purity	Not Reported; groundwater near landfills; Not Reported; Not Reported Notes: Mg3Si2O5(OH)4
Test Method Details, Test Condition Details, and Test Consistency Details	A MODFLOW model was used to evaluate landfill plume movement into aquifers. Nearby groundwater is in equilibrium with primary and secondary minerals in the aquifer.; Groundwater samples collected from study area had low dissolved oxygen and were colorless and odorless. pH ranged from 6.90 to 8.00 (exception: low pH 5.4) in ground water samples collected at Okhala landfill. Top layer of aquifer (0–30 m) shows significant EC (~ 2971 μS/cm), a decrease in middle (31–50 m) and bottom layers (51–80 m) indicate possible anthropogenic contribution in the top layer of the aquifer.; not reported
System Type Design	The pH of groundwater around the landfills is slightly alkaline, some landfill bore well samples were acidic and may be due to high contamination by leaching of trace-metals through the landfill; high loads of electrical conductivity reported in most samples indicate some anthropogenic influence on water quality.
Sampling Frequency and Sampling Details	not reported; Groundwater samples around landfills were collected in pre-monsoon (April–May) and post-monsoon (Sept–Oct) (years 2004–2006).
Test Temperature	not reported
Results Details	Chrysotile (Mg3Si2O5(OH)4) was reported as a saturated mineral in the bottom layer (51–80 m); chrysotile SI = 2.84 indicating chrysotile is a reactive mineral in the groundwater aquifer of study area. The seasonal and temporal variations indicate some anthropogenic influence along with geogenic input by chemical weathering.
Analytical Method and Analytical Details	Normalized inorganic charge balance (NICB) used in understanding the analytical precision of analyzed hydrogeochemical data in groundwater; Groundwater charge balance typically $\pm$5% error; saturation of minerals in groundwater: Ksp of minerals is in equilibrium with Ka; precipitation of minerals takes place in groundwater when Ka $>$ Ksp (values not explicitly defined in text, likely solubility product, Ksp and acid dissociation constant, Ka). SI defined as logIAP–logKT (values not explicitly defined in text); this study used PHREEQC for calculation of SI of groundwater in all seasons.
Transformation Products, Statistics, and Kinetics	Natural weathering of rock mineral is the major source of magnesium, sulfate and bicarbonate ions in groundwater which show concentration decrease with the depth. Mineral equilibrium diagram of groundwater showed it is in equilibrium with silicate minerals and favors kaolinite formation.; not reported; not reported
Reference Substance and Reference Substance Results	not reported; not reported

EVALUATION

Domain		Metric	Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified.
	Metric 2:	Test Substance Purity	N/A	The metric is not applicable to this study type.
Domain 2: Test Design				
	Metric 3:	Study Controls	N/A	The metric is not applicable to this study type.

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Study Citation:	Srivastava, S. K., Ramanathan, A. L. (2018). Assessment of landfills vulnerability on the groundwater quality located near floodplain of the perennial river and simulation of contaminant transport. Modeling Earth Systems and Environment 4(2):729-752.
OECD Harmonized Template:	Miscellaneous
HERO ID:	6895656

		EVALUATION		
Domain		Metric	Rating	Comments
	Metric 4:	Test Substance Stability	N/A	The metric is not applicable to this study type.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	N/A	The metric is not applicable to this study type.
	Metric 6:	Testing Conditions	High	Conditions were reported.
	Metric 7:	Testing Consistency	N/A	The metric is not applicable to this study type.
	Metric 8:	System Type and Design	High	Equilibrium was reported.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this study type.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	Low	The outcome assessment methodology did not explicitly address or report the intended outcome of interest.
	Metric 12:	Test Substance Purity	Medium	Details regarding sampling methods of the outcome were not fully reported.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	N/A	The metric is not applicable to this study type.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	Low	Analytical details were limited.
	Metric 16:	Statistical Methods and Kinetic Calculations	Low	Constant values for target chemical calculations not reported.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	Low	Quantitative results for coagulation/mobility were not reported.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study type.

Overall Quality Determination Medium

Study Citation:	Trivedi, A. K., Ahmad, I., Musthapa, M. S., Ansari, F. A., Rahman, Q. (2004). Environmental contamination of chrysotile asbestos and its toxic effects on growth and physiological and biochemical parameters of Lemna gibba. Archives of Environmental Contamination and Toxicology 47(3):281-289.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3080106

EXTRACTION

Parameter	**Data**
CASRN and Test Material	Not reported; Chrysotile asbestos
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; asbestos cement factory; NR; NR Notes: NR
Test Method Details, Test Condition Details, and Test Consistency Details	Asbestos analysis performed using American Public Health Association (APHA et al. 1998), United States Environmental Protection Agency (USEPA 1993), and Indian Standards [IS] (1986); Samples collected from areas near an asbestos cement factory in India (water, sediment, and plant); Sediment and plant samples were dried at 65°C, ashed at 500°C for 2 hours in muffle microwave, mixed with nitric acid, then diluted with deionized water
System Type Design	4 pond water and sediment samples collected (north, south, east, west), near an asbestos cement factory
Sampling Frequency and Sampling Details	not indicated, one time assumed; Not applicable
Test Temperature	Not applicable
Results Details	282-304 fibers/L in Pond Water, 360-420 fibers/g dw in Pond Sediment, Plants (range includes root, pedicel, and leaves): 24-41 Fiber/g dw in Nelumbo nucifera, 38-47 Fiber/g dw in Nymphaea nouchali, 23-44 Fiber/g dw in Ranunculus scleratus and 21 Fiber/g dw in Lemna gibba
Analytical Method and Analytical Details	analysis by phase-contrast polarized microscopicmethod (IS 1986) of length of asbestos fibers was measured and a relative count of fibers was estimated in the original material; fibers were transferred to a slide and made transparent with standard immersion oil
Transformation Products, Statistics, and Kinetics	Not applicable; Not applicable; Not applicable
Reference Substance and Reference Substance Results	Not applicable; Not applicable

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	High	The test substance was identified definitively.
	Metric 2:	Test Substance Purity	High	The source of the test substance was reported and the test substance identity and purity were verified by analytical means.
Domain 2: Test Design				
	Metric 3:	Study Controls	Medium	Concurrent control group details were not included; however, the lack of data was not likely to have a substantial impact on study results.
	Metric 4:	Test Substance Stability	High	The test substance stability, homogeneity, preparation, and storage conditions were reported, and were appropriate for the study.
Domain 3: Test Conditions				
	Metric 5:	Test Method Suitability	High	The test method was suitable for the test substance.
	Metric 6:	Testing Conditions	High	Testing conditions were monitored, reported, and appropriate for the method.

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Study Citation:	Trivedi, A. K., Ahmad, I., Musthapa, M. S., Ansari, F. A., Rahman, Q. (2004). Environmental contamination of chrysotile asbestos and its toxic effects on growth and physiological and biochemical parameters of Lemna gibba. Archives of Environmental Contamination and Toxicology 47(3):281-289.
OECD Harmonized Template:	Miscellaneous
HERO ID:	3080106

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 7:	Testing Consistency	High	Test conditions were consistent across samples or study groups. The conditions of the exposure were documented.
	Metric 8:	System Type and Design	Medium	Equilibrium was not established or reported but this was not likely to have a substantial impact on study results.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study type.
	Metric 10:	Sampling Methods	Low	The test organism or species is not routinely used for similar study types.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology addressed or reported the intended outcome(s) of interest.
	Metric 12:	Test Substance Purity	High	The study reported the use of sampling methods that address the outcome(s) of interest, and used widely accepted methods/approaches for the chemical and media being analyzed.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	High	Sources of variability and uncertainty in the measurements, and statistical techniques and between study groups (if applicable) were considered and accounted for in data evaluation.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this study type.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	High	The target chemical and transformation product(s) concentrations (if required), extraction efficiency, percent recovery, or mass balance were reported.
	Metric 16:	Statistical Methods and Kinetic Calculations	Low	Statistical analysis or kinetic calculations were not conducted.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	Reported values were within expected range as defined by reference substance(s).
	Metric 18:	QSAR Models	N/A	A QSAR model was not reported.

Overall Quality Determination — High

Study Citation:	Witek, J., Psiuk, B., Naziemiec, Z., Kusiorowski, R. (2019). Obtaining an artificial aggregate from cement-asbestos waste by the melting technique in an arc-resistance furnace.
OECD Harmonized Template:	Miscellaneous
HERO ID:	10190686

EXTRACTION

Parameter	Data
CASRN and Test Material	1332-21-4; asbestos
Confidentiality, Type, Guideline	None; Experimental; Experimental
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; asbestos-containing waste; cement-asbestos waste board; NR; NR Notes: A mixture of asbestos-containing material (AMC) was used at a composition of 85 wt% of ACM, 10 wt% of soda, and 5 wt% of feldspar in which chrysotile was identified.
Test Method Details, Test Condition Details, and Test Consistency Details	Melting of waste material containing asbestos.; Selected fluxes up to 1400°C were run in an electric arc-resistance furnace for 100 minutes; the material was then cast into a ceramic mold to form a material for aggregates; not applicable
System Type Design	electric arc-resistance furnace
Sampling Frequency and Sampling Details	not applicable; not applicable
Test Temperature	Up to 1400°C
Results Details	SEM/EDS analysis confirmed the complete destruction of asbestos fibers, including chrysotile destruction, during the melting process.
Analytical Method and Analytical Details	Chemical analysis of raw materials and melted product was performed via X-ray fluorescence according to method PN-EN ISO 12677:2011 standard.; A thermo-gravimetric analysis combined with an evolved gas analysis was performed in an alumina crucible, using an STA 409PC NETZSCH thermal analyser with quadrupole mass spectrometer. Tests were carried out in a synthetic air atmosphere. The phase composition of raw cement-asbestos waste, and melted product, was determined by powder X-ray diffraction. A mineralogical quantitative phase analysis of melted product was performed using the Rietveld method. Raw samples and the destruction of the fibrous nature of asbestos in the raw materials after melting, was observed via SEM in combination with an Energy Dispersive Spectroscopy (EDS) system.
Transformation Products, Statistics, and Kinetics	Chemical analysis of raw cement-asbestos waste: 19.3% SiO2, 0.2% TiO2, 3.9% Al2O3, 2.9% Fe2O3, 5.8% MgO, 41.8% CaO, <0.1% Na2O, and 0.4% K2O, 25.1% loss on ignition. Chemical analysis of raw cement-asbestos waste: 27.1% SiO2, 0.2% TiO2, 6.0% Al2O3, 3.6% Fe2O3, 7.3% MgO, 51.1% CaO, 0.3% Na2O, and 3.1% K2O, 0.2% loss on ignition.; not applicable; not applicable
Reference Substance and Reference Substance Results	not applicable; not applicable

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Test Substance				
	Metric 1:	Test Substance Identity	Low	The test substance was not a specific asbestos, but an anthropogenic waste material containing asbestos.
	Metric 2:	Test Substance Purity	Medium	The source was not specified, however, the composition was determined.
Domain 2: Test Design				
	Metric 3:	Study Controls	N/A	The study did not require concurrent control groups.
	Metric 4:	Test Substance Stability	High	The test substance preparation was reported.
Domain 3: Test Conditions				

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Study Citation:	Witek, J., Psiuk, B., Naziemiec, Z., Kusiorowski, R. (2019). Obtaining an artificial aggregate from cement-asbestos waste by the melting technique in an arc-resistance furnace.
OECD Harmonized Template:	Miscellaneous
HERO ID:	10190686

			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 5:	Test Method Suitability	Medium	The test method was suitable; however, details were omitted.
	Metric 6:	Testing Conditions	Medium	Temperature fluxes were not explicitly stated.
	Metric 7:	Testing Consistency	N/A	This metric is not applicable to this study type.
	Metric 8:	System Type and Design	High	The system type and design were appropriate.
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	The metric is not applicable to this study.
	Metric 10:	Sampling Methods	N/A	The metric is not applicable to this study.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology addressed or reported the intended outcome(s) of interest.
	Metric 12:	Test Substance Purity	High	No notable uncertainties or limitations were expected to influence results.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	N/A	The metric is not applicable to this study.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	The metric is not applicable to this study.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	High	Analytical methods used were suitable.
	Metric 16:	Statistical Methods and Kinetic Calculations	N/A	The metric is not applicable to this study.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	High	The study results were reasonable.
	Metric 18:	QSAR Models	N/A	The metric is not applicable to this study.

Overall Quality Determination High

Study Citation:	Schreier, H., Lavkulich, L. (2015). Cumulative effects of the transport of asbestos-rich serpentine sediments in the trans-boundary Sumas Watershed in Washington State and British Columbia. Canadian Water Resources Journal 40(3):262-271.
OECD Harmonized Template:	Other Properties
HERO ID:	3583161

EXTRACTION

Parameter	**Data**
CASRN and Test Material	12001-29-5; Asbestos
Confidentiality, Type, Guideline	No; experimental; Non-guideline: environmental monitoring
Solvent, Reactivity, Storage, Stability	NR; NR; NR; NR
Radiolabel, Source, State, Purity	NR; Sediments rich in chrysotile asbestos; Serpentinitic sediments; Not specified; asbestos-rich sediments with high Mg, Ni, and Cr with alkaline pH and low Ca and Zn Notes: natural landslide in the Sumas River Watershed in Washington State
Results Value	Water pH and sediment zeta potential (mV) upstream and downstream (May 2011 suspended sediments): Upstream Landslide pH 8.2, zeta +9.0; Downstream International border pH 7.7, zeta -7.8. Water pH and sediment zeta potential (mV) upstream to downstream (June 2011 suspended sediments): Upstream Landslide pH 8.7, zeta +10.3; Goodwin Rd. pH 8.7, zeta +10.3; South Pass Rd. pH 8.7, zeta +10.3; Downstream International border pH 8.7, zeta +10.3. Water pH and sediment zeta potential (mV) upstream to downstream (Mar 2011 suspended sediments): Upstream Landslide pH 8.2, zeta +8.9; Goodwin Rd. pH 8.1, zeta -2.8; South Pass Rd. pH 7.8, zeta -10.7. Water pH and sediment zeta potential (mV) upstream to downstream (May 2011 bed sediment): Upstream Landslide pH 8.2, zeta +10.3. Water pH and sediment zeta potential (mV) upstream to downstream (June 2011 bed sediment): Upstream Landslide pH 8.7, zeta -6.3. Water pH and sediment zeta potential (mV) upstream to downstream (Aug 2011 bed sediment): Upstream Landslide pH 8.1, zeta -9.3. Water pH and sediment zeta potential (mV) upstream to downstream (Dec 2011 bed sediment): Upstream Landslide pH 8.0, zeta -6.7; Goodwin Rd. pH 7.9, zeta -6.5; South Pass Rd. pH 7.4, zeta -14.7; Downstream International border pH 7.3, zeta -13.5. Water pH and sediment zeta potential (mV) upstream to downstream (Mar 2011 bed sediment): Upstream Landslide pH 8.2, zeta -1.6; Goodwin Rd. pH 8.1, zeta -11.7; South Pass Rd. pH 7.8, zeta -14.0; Downstream International border pH 7.4, zeta -17.8.
Results Details	Reference mineral material zeta potential: Kaolinite –3.2, Chrysotile +11.5
Results Remarks	Surface charge of samples were measured in distilled water. Surface charge analysis via Zeta Meter model 3.0+

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Test Substance			
Metric 1:	Test Substance Identity	High	The test substance was identified.
Metric 2:	Test Substance Purity	High	The source was reported.
Domain 2: Test Design			
Metric 3:	Study Controls	High	Controls were not explicitly included; however, reference substances were reported.
Metric 4:	Test Substance Stability	N/A	This metric is not applicable to this type of study.
Domain 3: Test Conditions			
Metric 5:	Test Method Suitability	High	The test method was appropriate.
Metric 6:	Testing Conditions	N/A	Field study; this metric is not applicable to this type of study.
Metric 7:	Testing Consistency	N/A	This metric is not applicable to this type of study.
Metric 8:	System Type and Design	N/A	Field study; this metric is not applicable to this type of study.

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Study Citation:	Schreier, H., Lavkulich, L. (2015). Cumulative effects of the transport of asbestos-rich serpentine sediments in the trans-boundary Sumas Watershed in Washington State and British Columbia. Canadian Water Resources Journal 40(3):262-271.
OECD Harmonized Template:	Other Properties
HERO ID:	3583161

			EVALUATION	
Domain		Metric	Rating	Comments
Domain 4: Test Organisms				
	Metric 9:	Outcome Assessment Methodology	N/A	This metric is not applicable to this type of study.
	Metric 10:	Sampling Methods	N/A	This metric is not applicable to this type of study.
Domain 5: Outcome Assessment				
	Metric 11:	Test Substance Identity	High	The outcome assessment methodology addressed the intended outcome of interest.
	Metric 12:	Test Substance Purity	N/A	This metric is not applicable to this type of study.
Domain 6: Confounding/Variable Control				
	Metric 13:	Confounding Variables	N/A	This metric is not applicable to this type of study.
	Metric 14:	Health Outcomes Unrelated to Exposure	N/A	This metric is not applicable to this type of study.
Domain 7: Data Presentation and Analysis				
	Metric 15:	Data Reporting	High	Data reporting appropriate for this type of study.
	Metric 16:	Statistical Methods and Kinetic Calculations	High	The study results were reasonable.
Domain 8: Other				
	Metric 17:	Verification or Plausibility of Results	N/A	This metric is not applicable to this type of study.
	Metric 18:	QSAR Models	N/A	A QSAR model was not reported.

Overall Quality Determination High

List of Abbreviations and Acronyms for Data Quality Evaluation and Extraction Tables

Term	Definition
BAF	Biaccumulation Factor
BCF	Bioconcentration Factor
BMF	Biomagnification Factor
BSAF	Biota-sediment Accumulation Factor
C	Concentration
CASRN	Chemical Abstract Service registry number
DOC	Dissolved Organic Carbon
dw	Dry weight
DW	Drinking Water
DWTP	Drinking Water Treatment Plant
EPA	Environmental Protection Agency
ESI	Electrospray Ionisation
FID	Flame Ionisation Detector
FPD	Flame Photometric Detector
GC	Gas Chromatography
g/L	Grams per Liter
HLC	Henry's Law Constant
HPLC	High-performance liquid chromatography
ISO	International Organization for Standardization
K_{oa}	Octanol-Air partition coefficient
K_{oc}	Organic carbon-water partition coefficient
K_{ow}	Octanol-Water partition coefficient
L/d	Liters per day
LOD	Limit of Detection
LOQ	Limit of Quantification
lw	Lipid weight
M	Molarity (mol/L = moles per Liter)
mL/min	Milliliters per minute
mM	Millimolar
MDL	Method Detection Limit
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
mg/m^3	Milligrams per cubic meter
MRL	Method Reporting Limit
MS	Mass Spectrometry
n	Sample Size
N/A	Not applicable
ND	Non-Detection
ng/L	Nanograms per Liter

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Term	Definition
nm	Nanometers
NR	Not Reported
OECD	Organisation for Economic Co-operation and Development
· OH	Hydroxyl radical
OPE	Organophosphate Ester
pg/L	Picograms per Liter
ppm	parts per million
QSAR	Quantatative Structure Activity Relationship
RSD	Relative Standard Deviation
SI	Supplemental Information
SIM	Selected Ion Monitoring
SPE	Solid Phase Extraction
STP	Sewage Treatment Plant
TMF	Trophic Magnification Factor
TOC	Total Organic Carbon
TOF	Time of Flight
μg/L or μg/mL	micrograms per liter or per milliliter
UPLC	Ultra-performance liquid chromatography
US or USA	United States of America
UV (UV-Vis)	Ultra Violet (Visible)
ww	Wet Weight
WWTP	Wastewater Treatment Plant