UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF CHEMICAL SAFETY AND POLLUTION PREVENTION

February 26, 2026

MEMORANDUM

SUBJECT: EPA's Approach for Assessing Environmental Hazard of Cathode Active Material New Chemical Substances using Standard Toxicity Profiles

TO: Shari Barash
Director
New Chemicals Division

SHARI BARASH Digitally signed by SHARI BARASH Date: 2026.02.26 14:48:31 -05'00'

FROM: Jennifer Brennan
Senior Environmental Assessor
New Chemicals Division

JENNIFER BRENNAN Digitally signed by JENNIFER BRENNAN Date: 2026.02.26 10:36:00 -05'00'

THROUGH: Jeffrey Gallagher
Supervisory Toxicologist
New Chemicals Division

ARIEL HOU Digitally signed by ARIEL HOU Date: 2026.02.26 11:20:56 -05'00'

Keith Salazar
Senior Science Advisor
New Chemicals Division

KEITH SALAZAR Digitally signed by KEITH SALAZAR Date: 2026.02.26 13:35:48 -05'00'

Anna Lowit
Senior Science Advisor
Office of Pollution Prevention and Toxics

ANNA LOWIT Digitally signed by ANNA LOWIT Date: 2026.02.26 14:42:52 -05'00'

Background

Mixed metal oxides (MMOs) are a key component in lithium-ion batteries used in electric vehicles (EVs). MMOs can also be used for semi-conductors and renewable energy generation and storage, such as solar cells and wind power turbines. MMOs typically consist of lithium, nickel, cobalt, and other metals, and are the key material for production of cathode active materials (CAMs) used in battery cells. New chemical substances (NCS) that are CAMs are assessed under Toxic Substances Control Act (TSCA) as Pre-Manufacturer Notices (PMNs) in EPA's New Chemicals Division (NCD). These MMO CAMs are proposed in battery applications at high production volumes (e.g., millions kg/year) and often lack submitted environmental hazard data.

Approach

EPA commonly uses aquatic toxicity profiles to characterize NCS environmental hazards for each screening-level risk assessment, including three acute (e.g., fish, aquatic invertebrates, and algae) and three chronic (e.g., fish, aquatic invertebrates, and algae) environmental receptors. Based on the assumption that once in the aquatic environment, the metal components may leach from the MMO CAM and are bioavailable, EPA has used the most conservative environmental endpoints (e.g., acute fish lethal concentration 50% [LC50] toxicity value) for each metal component contained within a PMN submission and adjusted for the percent composition of the individual metal's toxicity as compared to its presence in the MMO CAM (i.e., molecular-weight adjustment). The hazard values for the environmental endpoints for MMO CAMs are based on literature-derived[1] standard toxicity profiles (STPs) for individual metals commonly found in these types of NCS (Table 1). The STP approach underlays the foundation of environmental hazard assessment of metal-containing new chemical substances in NCD.

Table 1. Standard Toxicity Profiles (STPs) for common metals in MMO CAM New Chemical Substances.

Metal STP[a]	Environmental Hazard (mg/L)						Environmental Hazard Concern (H/M/L)[k]
	Fish acute[g]	Aquatic Invert acute[h]	Algal acute[i]	Fish ChV[j]	Aquatic Invert ChV[j]	Algal ChV[j]	
Li[b]	20	4.6	29	0.250	0.06	7.2	High
Co[c]	48	1.3	0.16	0.29	0.01	0.04	High
Ni[d]	15	0.11	0.23	0.44	0.04	0.09	High
Y[e]	0.03	2.9	0.15	0.003	0.29	0.11	High
Al[f]	11	5.7	0.51	3.3	0.96	0.10	High

[a] STP hazard values assume 100% metal.
[b] Fish (Hamilton 1995; ECOTOX 2008); Daphnia (Lilius et al 1995); Algae (ECOTOX 2008)
[c] Fish (Ewell et al 1986; PMN); Daphnia (Biesinger & Christensen 1972; Aqtox database; PMN); algae (PMN)
[d] Fish (Pickerling & Henderson 1996; WQC 1986; Ewell et 1986); Daphnia (Hockett & Mount 1996; WQC 1986; Biesinger & Christensen 1972; Pane et al 2004) Algae (Chen et al 1997; McKee & Wolf 1963)
[e] Fish (8e-14898); Daphnia (8e-14872); Algae (8e-14872)
[f] Fish (WQC 1988); Daphnia (WQC 1988); Algae (WQC 1988)
[g] Endpoint defined as fish 96-h lethal concentration 50 (LC50)
[h] Endpoint defined as aquatic invertebrate 48-h effective concentration 50 (EC50)
[i] Endpoint defined as algal 72-96-h inhibitory concentration 50 (IC50)
[j] Endpoint defined as Chronic Value (ChV) which is the geometric mean of the chronic no-observed effect concentration (NOEC) and the lowest-observed effect concentration (LOEC)
[k] Environmental hazard concern levels are based on acute and chronic ecotoxicity endpoints with low environmental hazard defined as ≥100 mg/L and ≥10 mg/L (acute and chronic, respectively), moderate environmental hazard defined as 1-99 mg/L and 0.1-9 mg/L (acute and chronic, respectively), and high environmental hazard defined as <1 mg/L and <0.1 mg/L (acute and chronic, respectively) as described in U.S. Environmental Protection Agency. 2018. Points to Consider When Preparing TSCA New Chemical Notifications. OMB Control No.: 2070-0012.

[1] Standard Toxicity Profiles (STPs) are based on metal toxicity data in the scientific literature, including data sources within EPA's Ecotoxicology (ECOTOX) Knowledgebase, as well as data from ambient water quality criteria studies from EPA's Office of Water (U.S. EPA, 2025u)

The potency of MMO CAMs varies among different metals but all present a high environmental hazard. STP-derived hazard values are molecular weight-adjusted based on the individual metal component's percentage in the MMO CAM (Equation 1). By doing so, the environmental hazard of that metal is more accurately reflected within context of the MMO CAM composition.

Equation 1. Molecular weight-adjustment of a STP-based hazard value for an example metal (Nickel, Ni) in a MMO CAM.

$$MW\ adj.hazard\ value\ for\ Ni = (Ni\ STP\ hazard\ value) \div (\%\ of\ Ni\ in\ MMO\ CAM \div 100\%)$$

Based on molecular weight adjustments of metal STPs, EPA has identified benchmark metal percentages that equate to high environmental hazard of MMO CAMs (Tables 2-6). MMO CAMs containing lithium, cobalt, nickel, yttrium, and/or aluminum at or above 70, 20, 20, 10, and 60%, respectively, will result in high environmental hazard for that MMO CAM. Percentages of lithium, cobalt, nickel, yttrium, and aluminum below these benchmarks would result in moderate or low hazard of the MMO CAM based on molecular-weight adjustment of the metal's individual STP values. This memo summarizes EPA's approach to assessing the environmental hazard of MMO CAM NCS using metal STPs in combination with molecular-weight adjustment of the individual metals within the MMO CAM.

Table 2. Environmental hazard profile of MMO CAMs based on percent **lithium (Li)**

% Li	**Environmental Hazard (mg/L)**						**Environmental Hazard Concern (H/M/L)**
	Fish acute[a]	**Aquatic Invert acute**[b]	**Algal acute**[c]	**Fish ChV**[d]	**Aquatic Invert ChV**[d]	**Algal ChV**[d]	
100	20	4.6	29	0.25	0.06	7.2	High
90	22.2	5.1	32	0.28	0.07	8.0	High
80	25	5.8	36	0.31	0.08	9.0	High
70	28.6	6.6	41	0.36	0.09	10.3	High
60	33.3	7.7	48	0.42	0.10	12	Moderate
50	40	9.2	58	0.50	0.12	14.4	Moderate
40	50	11.5	73	0.63	0.15	18	Moderate
30	66.7	15.3	97	0.83	0.20	24	Moderate
20	100	23.0	145	1.25	0.30	36	Moderate
10	200	46.0	290	2.50	0.60	72	Moderate

[a] Endpoint defined as fish 96-h lethal concentration 50 (LC50)
[b] Endpoint defined as aquatic invertebrate 48-h effective concentration 50 (EC50)
[c] Endpoint defined as algal 72-96-h inhibitory concentration 50 (IC50)
[d] Endpoint defined as Chronic Value (ChV) which is the geometric mean of the chronic no-observed effect concentration (NOEC) and the lowest-observed effect concentration (LOEC)

Table 3. Environmental hazard profile of MMO CAMs based on percent **cobalt (Co)**

% Co	Environmental Hazard (mg/L)						Environmental Hazard Concern (H/M/L)
	Fish acute[a]	Aquatic Invert acute[b]	Algal acute[c]	Fish ChV[d]	Aquatic Invert ChV[d]	Algal ChV[d]	
100	48	1.3	0.16	0.29	0.01	0.04	High
90	53.3	1.4	0.18	0.32	0.01	0.04	High
80	60	1.6	0.20	0.36	0.01	0.05	High
70	68.6	1.9	0.23	0.41	0.01	0.06	High
60	80	2.2	0.27	0.48	0.02	0.07	High
50	96	2.6	0.32	0.58	0.02	0.08	High
40	120	3.3	0.40	0.73	0.03	0.10	High
30	160	4.3	0.53	0.97	0.03	0.13	High
20	240	6.5	0.80	1.45	0.05	0.20	High
10	480	13.0	1.60	2.90	0.10	0.40	Moderate

[a] Endpoint defined as fish 96-h lethal concentration 50 (LC50)
[b] Endpoint defined as aquatic invertebrate 48-h effective concentration 50 (EC50)
[c] Endpoint defined as algal 72-96-h inhibitory concentration 50 (IC50)
[d] Endpoint defined as Chronic Value (ChV) which is the geometric mean of the chronic no-observed effect concentration (NOEC) and the lowest-observed effect concentration (LOEC)

Table 4. Environmental hazard profile of MMO CAMs based on percent **nickel (Ni)**

% Ni	Environmental Hazard (mg/L)						Environmental Hazard Concern (H/M/L)
	Fish acute[a]	Aquatic Invert acute[b]	Algal acute[c]	Fish ChV[d]	Aquatic Invert ChV[d]	Algal ChV[d]	
100	15	0.11	0.23	0.44	0.04	0.09	High
90	16.7	0.12	0.26	0.49	0.04	0.10	High
80	18.8	0.14	0.29	0.55	0.05	0.11	High
70	21.4	0.16	0.33	0.63	0.06	0.13	High
60	25	0.18	0.38	0.73	0.07	0.15	High
50	30	0.22	0.46	0.88	0.08	0.18	High
40	37.5	0.28	0.58	1.10	0.10	0.23	High
30	50	0.37	0.77	1.47	0.13	0.30	High
20	75	0.55	1.15	2.20	0.20	0.45	High
10	150	1.10	2.30	4.40	0.40	0.90	Moderate

[a] Endpoint defined as fish 96-h lethal concentration 50 (LC50)
[b] Endpoint defined as aquatic invertebrate 48-h effective concentration 50 (EC50)
[c] Endpoint defined as algal 72-96-h inhibitory concentration 50 (IC50)
[d] Endpoint defined as Chronic Value (ChV) which is the geometric mean of the chronic no-observed effect concentration (NOEC) and the lowest-observed effect concentration (LOEC)

Table 5. Environmental hazard profile of MMO CAMs based on percent **yttrium (Y)**

% Y	Environmental Hazard (mg/L)						Environmental Hazard Concern (H/M/L)
	Fish acute[a]	Aquatic Invert acute[b]	Algal acute[c]	Fish ChV[d]	Aquatic Invert ChV[d]	Algal ChV[d]	
100	0.03	2.9	0.15	0.003	0.29	0.11	High
90	0.03	3.2	0.17	0.003	0.32	0.12	High
80	0.04	3.6	0.19	0.004	0.36	0.14	High
70	0.04	4.1	0.21	0.004	0.41	0.16	High
60	0.05	4.8	0.25	0.005	0.48	0.18	High
50	0.06	5.8	0.30	0.006	0.58	0.22	High
40	0.08	7.3	0.38	0.008	0.73	0.28	High
30	0.10	9.7	0.50	0.010	0.97	0.37	High
20	0.15	14.5	0.75	0.015	1.45	0.55	High
10	0.30	29.0	1.50	0.030	2.90	1.10	High

[a] Endpoint defined as fish 96-h lethal concentration 50 (LC50)
[b] Endpoint defined as aquatic invertebrate 48-h effective concentration 50 (EC50)
[c] Endpoint defined as algal 72-96-h inhibitory concentration 50 (IC50)
[d] Endpoint defined as Chronic Value (ChV) which is the geometric mean of the chronic no-observed effect concentration (NOEC) and the lowest-observed effect concentration (LOEC)

Table 6. Environmental hazard profile of MMO CAMs based on percent **aluminum (Al)**

% Al	Environmental Hazard (mg/L)						Environmental Hazard Concern (H/M/L)
	Fish acute[a]	Aquatic Invert acute[b]	Algal acute[c]	Fish ChV[d]	Aquatic Invert ChV[d]	Algal ChV[d]	
100	11	5.7	0.51	3.3	0.96	0.10	High
90	12.2	6.3	0.57	3.7	1.07	0.11	High
80	13.8	7.1	0.64	4.1	1.20	0.12	High
70	15.7	8.1	0.73	4.7	1.37	0.14	High
60	18.3	9.5	0.85	5.5	1.60	0.17	High
50	22	11.4	1.02	6.6	1.92	0.20	Moderate
40	27.5	14.3	1.27	8.3	2.40	0.25	Moderate
30	36.7	19	1.70	11	3.21	0.33	Moderate
20	55	28.5	2.55	16.5	4.81	0.50	Moderate
10	110	57	5.10	33	9.62	1.00	Moderate

[a] Endpoint defined as fish 96-h lethal concentration 50 (LC50)
[b] Endpoint defined as aquatic invertebrate 48-h effective concentration 50 (EC50)
[c] Endpoint defined as algal 72-96-h inhibitory concentration 50 (IC50)
[d] Endpoint defined as Chronic Value (ChV) which is the geometric mean of the chronic no-observed effect concentration (NOEC) and the lowest-observed effect concentration (LOEC)