
Krzystyna Trzepla, Sinan Yatkin, Warren White, Nicole Hyslop
Croker Nuclear Laboratory, University of California, Davis, California, 95616, USA

Objective: To generate single and multi-element reference materials (RMs) on Polytetrafluoroethylene (PTFE, Teflon) filters using aerosol chamber at CNL-UC Davis (Fig.1), and utilize them in calibration and quality control (QC) of EDXRF analyzers in order to address the limitations of available resources.

Materials & Method: High purity salts and nanoparticles for single compound RMs (SE-RMs) are certified multi-elemental solutions containing 28 elements for multi-element RMs (ME-RMs).

Certified or Reference loadings of RMs:
- The loadings of SE-RMs (C_{cer}) are certified gravimetrically using a balance with 0.1 µg sensitivity.
- The ME-RMs reference loading of element i (C_{ref,i}) was assigned assuming:
  1. The elemental ratios in solutions are preserved onto ME-RMs.
  2. The potassium (K) measurement by UCD-EDXRF/C_{UCD-EDXRF} (Epsilon S, Panalytical Inc, the Netherlands) is accurate to be <10%. These assumptions resulted in estimated uncertainties below 10%.

Data Evaluation:
1. Agreement between certified loadings of SE-RMs and EDXRF: Linear regression, bias and En number (ISO/IEC 17043, 2010):
   \( U: \text{Expanded uncertainty by GUM (2008)} \)
   \( \text{When } En \leq 1, C_{EDXRF} \text{ and } C_{cer} \text{ are equivalent} \)
   
2. Linear regression between reference loading of ME-RMs (x) and lab (y),

3. z-score (ISO 13528:2005): Loadings in µg/cm² converted to µg/g for 12 ME-RMs in interlaboratory comparison

Results and Discussion:
- The slopes between C_{ref} and C_{EDXRF} (with intercept set to zero) are within 10% of unity. The EDXRF bias remained within 10% for Al, Si, S (at >1 µg/cm²), Cl (with a few exceptions), K, Ti, Fe and Zn.
- The En number remained <1 for most of the generated SE-RMs (Fig.3).
- For Ca (CaTiO₃) and Cr (CrN)

Work in progress:
- Checked SEs and ME-RMs show satisfactory stability except volatile elements.

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Publications