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Development of a radiochemical neutron activation analysis procedure for determination of arsenic in biological materials

Neutron activation analysis (NAA) has played a key role in the certification of As in biological reference materials at NIST. Instrumental neutron activation analysis (INAA) with counting of 76As is typically used to determine ≥1 mg/kg As in biological materials, though lower amounts may be determined, depending on the matrix. At lower levels, As determination is often hindered by the presence of significant amounts of 24Na, 82Br, or 32P. Radiochemical neutron activation analysis (RNAA) with retention of As on Hydrated Manganese Dioxide (HMD) has been used in the certification of As mass fractions in biological reference materials at levels < 1 mg/kg [1, 2]. Although this method provides very high and reproducible yields, and detection limits at low µg/kg levels, counting geometry uncertainties may arise from uneven distribution of As in the resins. Additionally, the method is not specific to arsenic since other elements (Ag, Cr, Mo, Nb, Sn, Sb, Se, Ta, W) are retained on the column, resulting in possible decreased detection limits for As. Finally, the method does not appear to be easily applicable to all matrices. Two methods are being investigated to yield minimized uncertainties associated with counting geometry, increased specificity for arsenic, and broader applicability. The first involves the use of an 77As tracer to monitor yields and correct for differences in counting geometry. The second method involves the use of a liquid extraction procedure in which 76As is counted in the liquid phase, thus minimizing uncertainties associated with counting geometry. The latter method promises to be specific to arsenic and applicable to a wider range of matrices.

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