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Uncertainty assessment in neutron activation analysis of biological materials

E.G. Moreira, M.B.A. Vasconcellos, M. Saiki

Instituto de Pesquisas Energéticas e Nucleares, IPEN/CNEN-SP, São Paulo, Brazil

The expression of measurement uncertainties in a standardized form is a requirement for result reliability and allows the comparison of results obtained in different laboratories in addition to the comparison of different laboratories. It is also important in reaching decisions about the compliance of results to regulatory limits, as measurement uncertainties have implications for the interpretation of the analytical results. Due to these important demands on the quality assurance of analytical laboratories, the presentation of analytical results with their related uncertainties is a recent requirement in method validation and laboratory accreditation. In this work, the uncertainty sources for the relative method of Instrumental Neutron Activation Analysis, INAA, applied to biological materials were identified according to the "EURACHEM/CITAC Guide on Quantifying Uncertainty in Analytical Measurement". The identified uncertainty sources were sample mass, elemental standards masses, element decay constants and sample and standards activities. In this last case, the various uncertainty sources for the irradiation step and for the gamma ray spectrometry measurement were considered The contribution of the uncertainty sources to the expanded standard uncertainty in the mass fraction of As, Co, Cr, Fe, K, Na, Se and Zn in biological materials were assessed and the major contribution, activity of sample and standards, was identified. As biological matrix materials, four certified reference materials were used, for checking the accuracy and precision of the INAA method: NIST SRM 1566b (Oyster Tissue), DORM-1 (Dogfish Muscle), DOLT-1 (Dogfish Liver) and MR-CCHEN-002 ("Almejas").

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