



Contribution ID: 995

Type: Verbal

Determination of nanogram levels of copper in a variety of matrices using instrumental, preconcentration and radiochemical neutron activation analysis

Thursday, 19 May 2022 08:30 (30 minutes)

Copper at low levels is generally considered an essential element. It can be determined by neutron activation analysis (NAA) via $^{63}\text{Cu}(n,\gamma)^{64}\text{Cu}$ and $^{65}\text{Cu}(n,\gamma)^{66}\text{Cu}$ reactions. The positron-emitting nuclide ^{64}Cu (half-life=12.7 h) is not commonly used because of interferences. The short-lived ^{66}Cu (half-life=5.09 min) can possibly be used in instrumental NAA (INAA). However, it is seldom done in practice due to the Compton background interferences from nuclides such as ^{28}Al , ^{38}Cl , and ^{24}Na . The ^{66}Cu nuclide decays by β -emission and a single non-coincident gamma-ray of 1039.2 keV. The peak efficiency reduction factor (PERF) of this peak was measured as 1.03. INAA in conjunction with anticoincidence counting (INAA-AC) technique was used for analyzing a number of reference materials with varying salt content for copper concentrations as low as 0.06 mg/kg.

Most elements of environmental and toxicological importance in natural waters are typically present at $\mu\text{g}/\text{kg}$ or lower levels. A reversed-phase extraction chromatographic (RPEC) preconcentration NAA (RPEC-PNAA) method using a porous inert support, namely Amberlite XAD-4 resin coated with the chelating agent 1-(2-thiazolylazo)-2-naphthol (TAN) was developed in our laboratory for the extraction of copper from aqueous samples including seawater with an absolute detection limit of 0.106 μg .

A radiochemical NAA (RNAA) method was also developed for the determination of very low levels of copper in diets and foods. The method involved irradiation of a sample for 15-20 min followed by rapid dissolution in a mixture of nitric and hydrochloric acids at low heat and coprecipitation of ^{66}Cu with thioacetamide in presence of 10 mg copper carrier. The precipitate was filtered through a polycarbonate membrane, dried, and counted.

Primary author: Prof. CHATT, Amares (Dalhousie University)

Co-author: ZHANG, Weihua (Radiation Protection Bureau of Health Canada)

Presenter: Prof. CHATT, Amares (Dalhousie University)

Session Classification: Nuclear Analytical Methods

Track Classification: Nuclear Analytical Methods