

Determination of Isotopic Uranium in Human Tissues by Combined Alpha Spectrometry and Neutron Activation Analysis

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The determination of isotopic uranium by alpha spectrometric methods is standard practice for bioassay and environmental measurements. While this method has excellent absolute detection limits (3.3 E-4 Bq) for most alpha emitting radionuclides, the very long half-lives of ²³⁸U and ²³⁵U limit the mass concentration detection limit. Additionally, enriched sources of uranium significantly limit the ability to determine the ²³⁸U content because of low yield alpha emission from ²³⁵U in the ²³⁸U alpha spectral region of interest. This is of significant concern because tissue samples obtained as a result of Department of Energy exposures may not have of natural isotopic abundance. By using a suitable source material, alpha spectrometric methods may be combined with neutron activation to provide independent determination of the ²³⁸U and ²³⁵U content. The NAA detection limits for ²³⁸U are comparable to the alpha spectrometric method but NAA is capable of much lower detection limits for ²³⁵U.

USTUR-0081-97