Development of a Methodology for Gamma-Spectrometric Analysis of Neutron-Irradiated Metallic Samples

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The present work describes the development and implementation of a methodology for the gamma-spectrometric characterization of metallic samples irradiated in different neutron fields with energies ranging from 2.4 up to 14 MeV. The samples studied consisted of a set of disc-shaped metallic elements manufactured from high-purity materials, including silver, tantalum, cobalt, and nickel. Following neutron irradiation, the samples were measured using High-Purity Germanium (HPGe) detectors, while spectral analysis was carried out with dedicated gamma-spectrometry software.

Correction factors were applied on the spectrometric data to account for true coincidence summing effects and photon self-attenuation within the sample volume. The activity induced in each sample was then determined from the corrected gamma-spectrometric measurements, enabling a quantitative evaluation of the activation of the specific metallic elements under the corresponding irradiation conditions.

The developed methodology demonstrates a reliable and reproducible approach for the quantitative gamma-spectrometric analysis of irradiated metallic samples. Furthermore, it contributes to the optimization of experimental procedures, correction protocols, and data-analysis practices employed in neutron-activation measurements and spectrometry laboratory operations.