

Study in Background Reduction for the Neutron Induced Prompt Gamma-ray Spectroscopy

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Neutron induced prompt gamma-ray spectroscopy (NIPS) system measures the prompt gamma-ray, emitting by the interaction of a neutron with various materials. This system will be of great benefit to scientists worldwide, since it provides the non-destructive measurement of many elements in either solid or liquid wastes. A NIPS facility has been developed in Nuclear Chemistry Research Division, at Korea Atomic Energy Research Institute (KAERI) with the aim of analyzing the major component elements in both aqueous and solid samples. The facility is equipped with a ^{252}Cf neutron source and coincidence set-up with two n-type coaxial HPGe detectors based on NIM spectrometric modules in association with data acquisition and spectral analysis systems. The neutron moderation and shielding materials were designed to minimized the background radiations. Two HPGe detectors were set horizontally at 90° with respect to the neutron beam direction to avoid unnecessary Compton scattering between two detectors. The coincidence system to reduce the interfering γ -ray background from the construction materials was used for the detection and measurement of coincidental events. The performance of the normal/coincidence/anti-coincidence NIPS system was tested by comparing signal-to-noise ratio in each mode. The prompt gamma characteristics of chlorine and nitrogen were observed using the chemical reagent of KCl and Melamine.

Key Words : Neutron, Prompt gamma-ray, Coincidence, Anti-Coincidence, HPGe detector