Contribution ID: **31** Type: **Poster**

Preliminary Study on Neutron Activation Analysis for Various Substances Using Room-temperature CZT Detector

Monday 27 June 2022 16:31 (1 minute)

Since the neutron activation analysis (NAA) technique is capable of non-destructive material analysis, it can be used in various areas including the detection of drugs and explosives that require the analysis of hazardous substances not specified in shape. In this study, we carried out various NAA experiments for several substances and obtain energy spectra of the gamma-ray emitted from the substances using a room-temperature CdZnTe (CZT) detector and neutron source including 252Cf and D-T generator. First, we figured out the characteristics of the prompt gamma-ray emitted from the hazardous substances by using MCNP6 toolkit. In the simulation, we modeled a neutron target substance with a cylindrical structure of 5 cm (R) × 10 cm (H), and the target substance was assumed to be composed of a single element (H, C, O, Si, and P). For the detector, we modeled 4 CZT detector modules composed of 4 CZT crystals with a dimension of 2.2 × 2.2 × 1.0 cm3. For the source, neutron with energy spectrum equivalent to 252Cf was modeled. Then, we carried out several NAA experiments for general substances including water, wood, glass, polyethylene, and PVC. In the experiment, the substance to be measured was placed in the center of 4 detector modules, and a 252Cf source (90 uCi) was attached to the substance. In addition, we carried out NAA experiments for 5 explosives using D-T generator of 2.5 × 109 n/s with the irradiation time of 20 minutes. The used explosives were provided by R.O.K Army Engineer School. The results show that the existence of element including H, C, O, Si, and P can be identified roughly by the analysis of the prompt gamma-ray energy spectra. In addition, the existence of N and O in the explosives was identified experimentally, and it was confirmed that the explosives can be identified and analyzed by NAA technique.

Primary author: KIM, Jae Hyeon (Korea Atomic Energy Research Institute)

Co-authors: Dr OH, Kyung Min (Korea Atomic Energy Research Institute); Dr LEE, Byeong-no (Korea Atomic Energy Research Institute); Mr YOO, Young-kwang (R.O.K.A. Engineer School); Mr SEUNG HWA, Baek (R.O.K.A. Engineer School)

Presenter: KIM, Jae Hyeon (Korea Atomic Energy Research Institute)

Session Classification: Poster