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Study on Neutron Activation Method Using UV-curing Resin Scintillator/光硬化型プラスチックシンチレータを用いた中性子放射化法の研究

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Neutron activation analysis is used in a variety of many fields, such as geology, medicine, and archaeology. In the neutron activation method, a sample is irradiated with neutrons and activated via neutron-induced reactions. The elemental composition is determined from the radioactivity of the sample. In measurement of radioactivities, -rays are often detected with a germanium detector which provides high enough energy resolution to identify γ-rays from the sample. If the resultant radioactive nuclides emit only β-rays, β-rays are detected with a β-ray detector such as gas counter for high energy β-rays or liquid scintillator for low energy β-rays. β-rays have shorter range than γ-rays. This property requires the sample to be thin enough for β-rays to emerge from the sample or to be dissolved into solvent of liquid scintillator. Thus, sample preparation including chemical processing is usually necessary. Measurement of pure β nuclides is not as easy as that of γ-ray emitting radionuclides. To make neutron activation analysis for pure β nuclides easier, a new technique is being developed in the present research. In the new method, sample material for analysis is added to plastic scintillator and the scintillator including the sample is irradiated with neutrons. The irradiated scintillator is attached to a photomultiplier tube to count β-rays to determine the radioactivity. This technique does not require complicated chemical process before or after irradiation. To study the feasibility of this technique, the method to fabricate scintillator including sample material was developed and test irradiation experiments were carried out at the Tokyo Institute of Technology (Tokyo Tech). A gold foil was irradiated with neutrons from the ^{7}Li(p,n)^{7}Be induced by bombarding a lithium target with a proton beam from a Pelletron accelerator of Tokyo Tech. β-rays from the gold foil were detected with the fabricated scintillator. This contribution will report the current progress and results of the development.

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