

Development of Neutron Activation Method Using UV Curable Resin Scintillator/紫外線硬化型シンチレーターを用いた中性子放射化法の研究

Thursday, 14 November 2024 16:00 (2 hours)

Strontium-88, which has a neutron magic number of 50, is important in s-process nucleosynthesis because it acts as a bottleneck in the s-process reaction network due to the small (n, γ) cross section. Therefore, the neutron captures cross sections need to be known with high precision for the reliable determination of the s-process abundances. However, there is disagreement between previous experiments. The Maxwellian-averaged neutron capture cross section at 30 keV was 6.13 ± 0.18 mb in Ref. [1] while 5.46 ± 0.45 in Ref. [2]. The two measurements were conducted with different methods: neutron activation method for Ref. [1] and time-of-flight (TOF) method for Ref. [2]. In general, the activation method is a well-established method but the measurement in Ref. [1] is different from the traditional activation method, in which γ -rays from the activated sample are counted with a Ge detector after irradiation. They detected electrons from β -decay with semiconductor detectors because the activated product ^{89}Sr ($T_{1/2} = 50.5$ days) does not emit γ -rays in the β -decay process. Although the β -ray spectrum was not shown in Ref. [1], the result may suffer from low signal-to-background ratio due to the low counting rate, causing overestimation of the cross section. Thus, the purpose of the present study is to improve the neutron activation analysis with a larger detector efficiency achieved by the plastic scintillator made of UV curable resin. The experimental plan and preliminary results will be presented in the presentation.

References

- [1] F. Käppeler et al., *Astrophys. J.* **355**, 348 (1990).
[2] T. Katabuchi et al., *Phys. Rev. C.* **108**, 10.1103 (2023).

Primary author: SHAO, Zefeng (Institute of Science Tokyo/東京科学大学)

Co-author: KATABUCHI/片渕, Tatsuya/竜也 (Institute of Science Tokyo/東京科学大学)

Presenter: SHAO, Zefeng (Institute of Science Tokyo/東京科学大学)

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