Study on keV-neutron capture cross sections and capture gamma-ray spectra of ^{117,119}Sn

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The neutron capture cross sections of long-lived fission products (LLFPs) are important physical quantities for the study on the transmutation of radioactive nuclear wastes. The nuclide ^{126}Sn is one of the LLFPs. However, there is no experimental data for ^{126}Sn, because the preparation of high-purity sample is difficult and, moreover, gamma-ray radiation from a sample causes a serious background.

On the other hand, keV-neutron capture cross sections and capture gamma-ray spectra of stable Sn isotopes contain important information which is useful for the evaluation of capture cross sections of ^{126}Sn. Thus, we have started a systematic measurement and calculations of keV-neutron capture cross sections and capture gamma-ray spectra of stable Sn isotopes. In the present contribution, the results for $^{117, 119}$Sn are shown.

The capture cross sections and capture gamma-ray spectra of $^{117, 119}$Sn were measured in the incident neutron energy region from 10 to 100 keV and at 550 keV, using the 3-MV Pelletron accelerator of the Research Laboratory for Nuclear Reactors at the Tokyo Institute of Technology. Pulsed keV neutrons were produced from the ^{7}Li(p,n)^{7}Be reaction with a 1.5-ns bunched proton beam from the accelerator. The $^{117, 119}$Sn samples were highly enriched metal plates, and the net weight of each sample was about 1 g. Capture gamma rays were detected with a large anti-Compton NaI(Tl) spectrometer by means of a time-of-flight method. A pulse-height weighting technique was applied to the observed capture gamma-ray pulse-height spectra to obtain capture yields. Using the standard capture cross sections of ^{197}Au, the capture cross sections of $^{117, 119}$Sn were derived with the error of about 5%. Capture gamma-spectra were derived by unfolding the observed capture gamma-ray pulse-height spectra. The present cross section results were compared with other experimental data and the evaluated values in JENDL-3.3 and ENDF/B-VI.

The calculation of capture cross sections and capture gamma-ray spectra of $^{117, 119}$Sn were performed with the EMPIRE-II code in the incident neutron energy region from 10 to 1000 keV. The calculated results were compared with the present experimental results.

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