

論文 / 著書情報
Article / Book Information

題目(和文)	Am-243の中性子捕獲断面積に関する研究
Title(English)	
著者(和文)	児玉有
Author(English)	Yu Kodama
出典(和文)	学位:博士(工学), 学位授与機関:東京工業大学, 報告番号:甲第12457号, 授与年月日:2023年3月26日, 学位の種別:課程博士, 審査員:片渕 竜也,小原 徹,千葉 敏,林崎 規託,相樂 洋
Citation(English)	Degree:Doctor (Engineering), Conferring organization: Tokyo Institute of Technology, Report number:甲第12457号, Conferred date:2023/3/26, Degree Type:Course doctor, Examiner:,,,,,
学位種別(和文)	博士論文
Category(English)	Doctoral Thesis
種別(和文)	論文要旨
Type(English)	Summary

(博士課程)
Doctoral Program

論文要旨

THESIS SUMMARY

系・コース： Department of, Graduate major in	融合理工学 原子核工学	系 コース	申請学位 (専攻分野)： Academic Degree Requested	博士 Doctor of	(工学)
学生氏名： Student's Name	児玉 有		指導教員 (主)： Academic Supervisor(main)	片瀬 竜也	
			指導教員 (副)： Academic Supervisor(sub)		

要旨 (英文 800 語程度)

Thesis Summary (approx.800 English Words)

Accurate nuclear data for minor actinides (MAs) are important for the design of the nuclear transmutation systems to reduce the impact of nuclear waste disposal on the environment and for burn-up analysis for actinide composition in nuclear fuel cycle scenarios. Especially, americium-243 is one of the most important MAs in the study of nuclear transmutation since contributes to the long-term radiotoxicity of the spent fuels due to its half-life (7370 y). The neutron capture cross section of ^{243}Am has also a pivotal role to produce ^{244}Cm , in important source of the decay heat in treating radioactive wastes. These days, measurements of nuclear data for MAs are ongoing in the Accurate Neutron-Nucleus Reaction Measurement Instrument (ANNRI) beamline at the Materials and Life Science Experimental Facility (MLF) of the Japan Proton Accelerator Research Complex (J-PARC). However, there is a problem related to the accelerator operation of J-PARC. The serious problem makes it difficult to measure the accurate nuclear data. From these viewpoints, we measured the capture cross section of ^{243}Am in the keV-energy region by using neutron filtering technique to solve the issue associated with the accelerator operation. Furthermore, we measured the capture cross section of ^{243}Am in the energy range from the thermal to keV. In addition, the resonance analysis was made by using the REFIT computer code. In the present study, we set a target accuracy of 5% smaller than the uncertainties, that stem from the poor quality of the experimental data, evaluated to be 10% or higher.

The keV-neutron capture cross section were measured by employing the neutron filtering technique with ^{nat}Fe , ^{nat}Si and ^{nat}Cr as a filter material in the ANNRI beamline. The quasi-monoenergetic energy neutron beam with the keV-energy was obtained by using the neutron filters. The neutron capture gamma-rays were detected a NaI(Tl) spectrometer. The pulse height weighing technique was employed to derive the neutron capture yield from pulse height spectra. The cross section at the energy of 23.5 keV was determined relative to the ^{197}Au capture cross section of JENDL-4.0 with uncertainty smaller than that of past experimental data. Compared with the present results, the previous experimental data and the evaluated data of JENDL-4.0 are smaller by 10%.

Measurements of the neutron capture cross section of ^{243}Am were carried out at the ANNRI beamline of MLF/J-PARC. The time-of-flight (TOF) method using a NaI(Tl) detector was employed with the pulse neutron source by the spallation reaction in MLF/J-PARC. The cross section was determined by normalizing the results to JENDL-4.0 cross section data at the third resonance of ^{243}Am . The thermal cross section is in good agreement with the latest experimental data and evaluated data from JENDL-5 and ENDF/B-VIII.0 within uncertainties. In keV-energy region, the present result is in good agreement with the previous results within uncertainties but larger than the evaluations of JENDL-5. The result measured by the neutron filtering technique is in good agreement with the present result, which shows the consistent results between different measurements.

Moreover, the resonance analysis was conducted by using the REFIT code in order to derive the resonance parameters in the energy region from thermal to 40 eV. The average radiation width is in good agreement with JENDL-5 and the past experimental data but the evaluated data from ENDF/B-VIII.0 is smaller than the present value.

To summarize this study, the capture cross section of ^{243}Am were measured with higher accuracy than the previous experimental data and the target accuracy of 5% was achieved. Moreover, the problem related to the accelerator operation was solved by employing the neutron filtering technique. The present study will contribute to the improvement of the accuracy of nuclear data library.

備考：論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。

Note：Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1copy of 800 Words (English).

注意：論文要旨は、東工大リサーチリポジトリ(T2R2)にてインターネット公表されますので、公表可能な範囲の内容で作成してください。

Attention: Thesis Summary will be published on Tokyo Tech Research Repository Website (T2R2).