

# Thermal neutron cross-section and resonance integral of the $^{98}\text{Mo}(n,\gamma)^{99}\text{Mo}$ reaction

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**Abstract:** We measured the thermal neutron cross-section and the resonance integral of the  $^{98}\text{Mo}(n,\gamma)^{99}\text{Mo}$  reaction by the activation method using a  $^{197}\text{Au}(n,\gamma)^{198}\text{Au}$  monitor reaction as a single comparator. The high-purity natural Mo and Au metallic foils with and without a cadmium shield case of 0.5 mm thickness were irradiated in a neutron field of the Pohang neutron facility. The induced activities in the activated foils were measured with a calibrated p-type high-purity Ge detector. The necessary correction factors for the  $\gamma$ -ray attenuation ( $F_g$ ), the thermal neutron self-shielding ( $G_{th}$ ) and the resonance neutron self-shielding ( $G_{epi}$ ) effects, and the epithermal neutron spectrum shape factor ( $\alpha$ ) were taken into account. In addition, for the  $^{99}\text{Mo}$  activity measurements, the correction for true coincidence summing effects was also taken into account. The thermal neutron cross-section for the  $^{98}\text{Mo}(n,\gamma)^{99}\text{Mo}$  reaction has been determined to be  $0.136 \pm 0.007$  barn, relative to the reference value of  $98.65 \pm 0.09$  barn for the  $^{197}\text{Au}(n,\gamma)^{198}\text{Au}$  reaction. The present result is, in general, in good agreement with most of the experimental data and the recently evaluated values of ENDF/B-VII.0, JENDL-3.3, and JEF-2.2 by 5.1% ( $1\sigma$ ). By assuming the cadmium cut-off energy of 0.55 eV, the resonance integral for the  $^{98}\text{Mo}(n,\gamma)^{99}\text{Mo}$  reaction is  $7.02 \pm 0.62$  barn, which is determined relative to the reference values of  $1550 \pm 28$  barn for the  $^{197}\text{Au}(n,\gamma)^{198}\text{Au}$  reaction. The present resonance integral value is in general good agreement with the previously reported data by 8.8% ( $1\sigma$ ). © 2008 Elsevier B.V. All rights reserved.

**Author Keywords:** 65 MeV electron linac;  $^{197}\text{Au}(n,\gamma)^{198}\text{Au}$ ;  $^{98}\text{Mo}(n,\gamma)^{99}\text{Mo}$ ; Activation method; Pulsed neutron facility; Resonance integral; Thermal neutron cross-section

**Index Keywords:** Cadmium; Farm buildings; Germanium; Linear accelerators; Molybdenum; Neutron scattering; Reactor cores; Resonance; Shielding; 65 MeV electron linac; Activation method; Pulsed neutron facility; Resonance integral; Thermal neutron cross-section; Neutrons

Year: 2009

Source title: Nuclear Instruments and Methods in Physics Research, Section B: Beam Interactions with Materials and Atoms

Volume: 267

Issue: 3

Page : 462-468

Link: [Scopus Link](#)

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ISSN: 0168583X

CODEN: NIMBE

DOI: 10.1016/j.nimb.2008.12.003

Language of Original Document: English

Abbreviated Source Title: Nuclear Instruments and Methods in Physics Research, Section B: Beam Interactions with Materials and Atoms

Document Type: Article

Source: Scopus

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