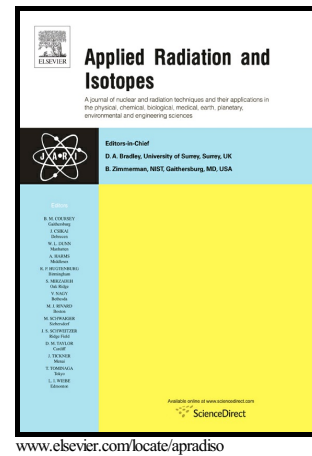


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A method for measuring macroscopic cross-sections for thermal neutrons

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Abstract

A method was proposed for measuring macroscopic absorption and scattering cross-sections for thermal neutrons. It is based on a Pu-Be neutron source and He-3 neutron detectors assembly. A beam of neutrons was obtained from the source imbedded in a water tank. The He-3 detectors oriented inside the sample and at 180° and 0° with respect to the incident neutron beam were used to register neutrons after interaction with the samples. Neutron count rates (detectors responses) were obtained for large (5.5 l) as well as small (1.3 l) volumes of standard samples. Sensitivities of the results obtained for the large and small samples were compared. A semi-empirical model was proposed to fit the results. It describes the relative detector responses in terms of a dimensionless variable which depends on the geometrical parameters and cross section of the standard samples used. The model successfully fits the results obtained. Advantages and limitations of the method were discussed.

Keywords: *Macroscopic, scattering, absorption, neutrons , response, He-3 detector, semi-empirical*

1.Introduction

The macroscopic thermal neutron cross section is the effective cross sectional area of a unit volume of material necessary for thermal neutron capture and/or scattering. It involves the volume fraction

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