

ABSTRACT

The neutron capture cross sections of the radioactive isotope ^{151}Sm and of natural samarium have been measured in the energy range from 3 to 225 keV at the Karlsruhe 3.7 MV Van de Graaff accelerator. Neutrons were produced via the $^7\text{Li}(p, n)^7\text{Be}$ reaction by bombarding metallic Li targets with a pulsed proton beam and capture events were registered with the Karlsruhe 4π Barium Fluoride Detector. The cross sections were determined relative to the gold standard using a 206 mg sample of samarium oxide with 90% enrichment in ^{151}Sm . Over most of the measured energy range uncertainties of $\sim 2\text{-}3\%$ could be achieved. The Maxwellian averaged neutron capture cross section of ^{151}Sm was calculated for thermal energies between $kT = 8$ keV and 100 keV. Together with the result from a parallel measurement at the CERN n_TOF facility on the same sample, this is the first experimental result for the neutron capture cross section of this important branching point isotope in the reaction path of the astrophysical s -process. The measured ^{151}Sm cross section is systematically larger than all theoretical calculations used in previous s -process analyses.