Neutron-induced fission cross section of 240Pu from 0.5 MeV to 3 MeV

Abstract:
240Pu has recently been pointed out by a sensitivity study of the OECD-Nuclear Energy Agency (NEA) to be one of the isotopes whose fission cross section lacks accuracy to meet the upcoming needs for the future generation of nuclear power plants (GEN-IV). In the High Priority Request List (HPRL) of the OECD, it is suggested that the knowledge of the 240Pu(n,f) cross section should be improved to an accuracy within 1-3%, compared to the present 5%. A measurement of the 240Pu cross section has been performed at the Van de Graaff accelerator of the JRC-IRMM using quasimonoenergetic neutrons in the energy range from 0.5 MeV to 3 MeV. A Twin Frisch-Grid Ionization Chamber (TFGIC) has been used in a back-to-back configuration as fission fragment detector. The 240Pu(n,f) cross section has been normalized to three different isotopes: 237Np(n,f), 235U(n,f) and 238U(n,f). Additionally, the secondary standard reactions were benchmarked through measurements against the primary standard reaction 235U(n,f) in the same geometry. A comprehensive study of the corrections applied to the data and the associated uncertainties is given. The results obtained are in agreement with previous experimental data at the threshold region. For neutron energies higher than 1 MeV, the results of this experiment are slightly lower than the ENDF/B-VII.1 evaluation, but in agreement with the experiments of Laptev et al. (2004) as well as Staples and Morley (1998).

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