

Dependence of the prompt fission gamma-ray spectrum on the entrance channel of compound nucleus: spontaneous vs neutron-induced fission

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Prompt gamma-ray spectra were measured for the spontaneous fission of $^{240,242}\text{Pu}$ and the neutron-induced fission of $^{239,241}\text{Pu}$ with incident neutron energies ranging from thermal to about 100 keV. Measurements were made using the Detector for Advanced Neutron Capture Experiments (DANCE) array in coincidence with the detection of fission fragments using a parallel-plate avalanche counter. Comparison of the unfolded prompt fission gamma-ray spectrum (PFGS) between spontaneous and neutron-induced fission reactions is shown in the figure below. The PFGS can be reproduced reasonably well by a Monte Carlo Hauser-Feshbach statistical model for the neutron-induced fission channel but not for the spontaneous fission channel. However, this entrance-channel dependence of the prompt fission gamma-ray emission can be described qualitatively by the model due to the very different fission-fragment mass distributions and a lower average fragment spin for spontaneous fission. The description of measurements and the discussion of results are presented.

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