New Resonance Parameter Evaluation of K Neutron Cross Sections

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Improved measurements and evaluations are needed for many elements for which the existing evaluations or the underlying nuclear cross-section data are not sufficiently accurate for the reliable calculation of criticality safety margins. Deficiencies in the existing ENDF/B-VI data evaluation for K led us to carry out a new resonance parameter evaluation of K neutron cross sections in the resolved-resonance region with the multilevel Reich-Moore R-matrix formalism. Our evaluation takes advantage of recent high-resolution capture and transmission measurements at the Oak Ridge Electron Linear Accelerator (ORELA), as well as older total cross-section measurements at Karlsruhe (KFK), to extend the resolved-resonance energy range to 1.0 MeV with more accurate representation of the data than in previous evaluations.

Resonance analyses were carried out with the computer code SAMMY, which utilizes Bayes' method, a generalized least-squares technique. Doppler and resolution broadening, multiple scattering corrections, and other effects were taken into account. Our resonance parameter representation describes the data much better than does ENDF/B-VI, and it should lead to improved criticality safety calculations for systems in which K is present. In this paper we discuss the cross-section data, resonance analysis, results, parameter uncertainties, and distributions of the level spacings and reduced neutron widths.

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