

Capture neutron cross sections measurements of rare earth isotopes

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Abstract

Results of TOF measurements for total and capture neutron cross sections on isotope Ho^{165} , conducted on pulsed spallation neutron source RADEX, are presented. Pulse duration of accelerator's proton beam 250 nanoseconds, combined with 100 nanoseconds steps of data acquisition system and 80 nanosecond pulses of (n, γ) detector provided, at 50 meter base of vacuum neutron guide, value of TOF spectrometer resolution 6 nanoseconds per meter.

Measurements were done during linear proton accelerator's work for our task in years 2020 and 2021. Beam parameters were: proton energy 247 and 305 MeV, pulsed proton current 0.01 Amperes, pulse duration 250 nanoseconds, frequency 50 Hz. Average beam power 40 W provided average neutron intensity on Ho^{165} pattern 4000 n/cm²sec. Recycle neutrons were cut using cadmium filter.

Experimental results were compared with 4 world neutron databases: ENDF /B-VII.1, JEFF-3.1, JENDL-4.0, and ROSFOND. New experimental data on cross section resonance structure of Ho^{165} were achieved and are presented.