Calculation of neutron production in (alpha,n) reactions with SOURCES4

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Sensitivity of underground experiments searching for rare events due to dark matter or neutrino interactions is often limited by the background caused by neutrons from spontaneous fission and (α, n) reactions from naturally occurring radioisotopes. A number of computer codes are available to calculate cross-sections of (α, n) reactions and neutron yields. We have used EMPIRE2.19/3.2.3 and TALYS1.9 codes to calculate neutron production cross-sections and show here a comparison of the results with experimental data. SOURCES4 is one of the tools to evaluate neutron production in different materials. We have updated the library of the modified SOURCES4A code to include the newly calculated cross-sections and recent experimental data. Neutron yields and energy spectra have been calculated using optimised cross-sections in SOURCES4A based on experimental data if available and reliable, complemented by calculations from one of the three models: EMPIRE2.19, EMPIRE3.2.3 or TALYS1.9. We present here the comparison of these neutron yield calculations with experimental data.

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