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# Application of Monte Carlo simulation to design a modular <sup>241</sup>Am-Be neutron irradiator irradiator

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Neutron irradiator facilities with 241Am-Be sources are worldwide available in order to perform neutron activation analysis (NAA), to investigate materials in different research areas or to test and calibrate neutron detectors and environmental or personal dosemeters. The use of a neutron irradiator is advantageous because have a very stable neutron flux, even it is many orders of magnitude lower than the one of a nuclear reactor or a particle accelerator. Many of irradiators are realized with neutron sources located at fixed positions and accordingly the characteristics of neutron spectrum previously assessed do not change. However, an interesting chance is to have a modular facility, capable of varying conditions of irradiation and setting the prevalence of fast or thermal neutron spectrum component.
In this work we report the Monte Carlo studies devoted to design a modular 241Am-Be neutron irradiator making use of different moderators (water, graphite, polyethylene and so on) in order to obtain a neutron energy distribution useful to test neutron detectors or personal dosemeters.
The optimization of thicknesses and shape of the moderators and shielding materials was obtained with a Monte Carlo simulation with MCNP5 code. An experimental test to verify the reliability of the simulation by means of NAA of selected materials was also performed. Once realized, the designed neutron irradiator will provide an useful facility for radiochemical material studying and testing and calibration of personal dosemeters or neutron measurement equipments.

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