



ID de Contribution: 21

Type: Non spécifié

Neutron capture on Cr for criticality safety via time-of-flight at CERN n_TOF and activation at CNA HiSPANoS with 30 and 90 KeV quasi-Maxwellian spectra

vendredi 19 janvier 2024 11:10 (30 minutes)

The NEA High priority Request List [Plompen:2007] features the neutron capture on ^{50}Cr and ^{53}Cr between 1 and 100 keV as very relevant for criticality safety. In the case of ^{50}Cr , the product of the (n,γ) reaction is ^{51}Cr , unstable with a half-life of 27.7 days which makes it suitable for neutron activation experiments. Although several time-of-flight experiments have been performed, including a recent one at the CERN n_TOF facility [Guerrero:2021]. Neutron activation should be in principle more accurate, but to date only one experiment has been published [Xia:2002], being the corresponding publication just a 2 pages conference proceeding.

In this work we present an activation measurement performed last year at the CNA HiSPANoS facility (Sevilla, Spain) to determine the (n,g) maxwellian-averaged cross section (MACS) of ^{50}Cr . In addition to measure the activation to a neutron beam with a 30 keV quasi-maxwellian energy distribution -produced by the $^7\text{Li}(p,n)$ reaction with 1912 keV protons, and routinely employed in activation measurements- we applied a novel method to develop a quasi-maxwellian 90 keV beam, based on the superposition of the distributions produced via $^7\text{Li}(p,n)$ reaction with different incident beam energies. The activation with a 90 keV MB distribution is of high interest for stellar nucleosynthesis studies, in particular to study the weak s-process. We will present preliminary results of the activation at 30 and 90 keV on ^{50}Cr and ^{197}Au , whose (n,g) cross section is well-known and its MACS at 30 keV is considered a standard.

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Classification de Session: Session 7