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Optimization and characterization of the FaNGaS facility at MLZ

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Prompt Gamma Neutron Activation Analysis (PGNAA) with cold/thermal neutrons is a well-established, non-destructive nuclear analytical technique to determine the elemental composition of different materials, especially small and thin samples. Thanks to their penetration depth, neutrons with a higher energy are a better choice for the analysis of large samples. For this purpose, an instrument called FaNGaS (Fast Neutron Gamma Spectrometry) was designed in the framework of a joint research project (FZJ/MLZ, financially supported by BMBF) and installed at the research neutron source Heinz Maier-Leibnitz (FRM II, Garching).
FaNGaS is a new instrument at the MEDAPP (MEDical APPlication) irradiation facility and uses the intense fission neutron beam delivered by the SR10 guide. The instrument is an electro-mechanically cooled, well-shielded HPGe detector connected to a digital spectrometer. In the first version of FaNGaS, the fast neutron beam was collimated using two collimators located at the outlet of the beam port and designed to filter thermal and epithermal neutrons.
A first characterization of FaNGaS was presented in 2015. Since then, certain changes have been made on the instrument. Further improvements and performance studies of FaNGaS are carried out jointly by JCNS/FZJ and the PGAA group of MLZ. The detector shielding will be modified supported by Monte Carlo simulations. The idea of a new collimator and filter arrangement will also be presented as well as the analytical method for large samples.
The aim of the FaNGaS project is to develop a nondestructive method for chemical analysis of large samples. The method is based on the analysis of prompt gamma radiation induced by fission neutrons. The main reaction for these fast neutrons is the inelastic neutron scattering or (n,n´γ) reaction. To perform chemical analysis of large samples with fission neutrons a comprehensive library on (n,n´γ) reaction needs to be improved. We are currently working on an update of the existing atlas. The outcome of the modifications and the characterization together with the first experimental results will be shown.

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