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ORAL PRESENTATION - Enhancing the dynamic range for high boron concentrations in low neutron capture cross-section matrices with Prompt Gamma Activation Analysis

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At the beam line of Prompt Gamma Activation Analysis (PGAA), one of the most powerful cold neutron beams in the world is available for experiments with neutrons. It offers unique possibilities to improve the detection limits, counting statistics and allows even the detection of trace elements and extremely small samples.

Problems arise, if relatively high amounts of high-cross-section elements like boron are to be detected in a matrix of elements with relatively low neutron capture cross-sections such as aluminum or silicon. In these cases the high-purity germanium detector (HPGe) can be saturated even when using small sample masses. For the case that the sample mass or the neutron flux is reduced to lower the count rates, the dynamic ranges of the peak areas do not change. The idea was to suppress the low energy gamma radiation mainly from boron more than the higher energy one from matrix elements using Pb sheets with different thicknesses. The efficiencies without lead attenuator, with 5mm and 10mm of lead in front of the detector were determined and samples with different nominal compositions made of milled powder mixtures of SiO_2, Al_2O_3, and H_3BO_3 were analyzed using the appropriate efficiencies.

The technical details of the method and the results of the first experiments will be presented.

Primary author: Mr SOELLRADL, Stefan (Paul Scherrer Institute & Universität Bern, Switzerland)

Co-authors: TÜRLER, Andreas (P); LUEHRS, Hanna (Universität Bremen); CANELLA, Lea (Technische Universität München); KUDEJOVA, Petra (Technische Universitaet Muenchen); REVAY, Zsolt (Technical University Munich)

Presenter: Mr SOELLRADL, Stefan (Paul Scherrer Institute & Universität Bern, Switzerland)

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