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Fast neutron inelastic scattering technique for characterization of rare-earth elements in magnetic materials

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Recycling of rare-earth elements contained in magnetic materials is an important step towards sustainability of valuable resources. The challenges are many and such tasks require analytical techniques to characterize the composition of the waste flows. Characterization of the rare-earth elements in industrial scale is a new challenge to take up. The existing traditional methods used for determination of rare earth elements content are usually based on chemical analytical methods such as ICP-MS or –OES and non-destructive methods such as XRF and LIPS. However, the former require chemical dissolution of a part of a sample and the latter provide only a near surface information. Non-destructive methods based on PGNAA with cold or thermal neutrons reach their performance capabilities in such applications due to attenuation of the interrogation beam in bulk and dense waste flows. Fast neutron inelastic scattering prompt gamma activation (PGA-INS) technique has been proposed as a promising technology to tackle the mentioned challenges. In this presentation, we discuss on the method physics, instruments and detection methodologies, present the preliminary experimental results acquired with the FaNGaS instrument installed the Heinz Maier-Leibnitz Zentrum (MLZ) in Garching, as well as provide an outlook on the future research activities necessary for method application in industrial tasks.

Author: Dr MELESHENKOVSKII, Iaroslav (JCNS FZ-Juelich)

Co-authors: Dr MAUERHOFER, Eric (JCNS FZ-Juelich); Prof. BRÜCKEL, Thomas (JCNS FZ-Juelich)

Presenter: Dr MELESHENKOVSKII, Iaroslav (JCNS FZ-Juelich)

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