

Poster Presentations

[MS3-P01] **HEIMDALLR: A time-of-flight neutron powder diffractometer going beyond today's designs by offering additionally a SANS and an imaging option** S.L.Holm^a, A. Singh^b, J.Schefer^b, K.Lefmann^a, M.Christensen^c

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Ongoing improvements in material performances are reached for example by the incorporation of advanced ceramics and polymers into heterogeneous systems. Their performances usually depend on the interplay between properties defined by the atomic, nano/mesoscopic and microscopic structure. Traditionally such structural information is collected in separated experiments such as wide angle diffraction (probing the atomic scale, $0.3\text{\AA}-1\leq Q\leq 50\text{\AA}^{-1}$), small angle diffraction (nano/meso scale, $0.002\text{\AA}^{-1}\leq Q\leq 0.1\text{\AA}^{-1}$) and direct space imaging techniques (sub-micronic to millimeter scale).

The hybrid instrument HEIMDALLR proposed by a collaboration of the University of Aarhus, Copenhagen and the Paul Scherrer Institute to be build at the European Spallation Neutron Source ESS (Lund/Sweden) is designed to obtain a coherent multi-length scale picture of these materials. The idea is to complement neutron powder diffraction (probed length $\xi\sim 0.01-5\text{nm}$) by add-ons: Small angle neutron scattering ($\xi\sim 1-200\text{nm}$) and neutron imaging ($\xi\sim 0.05-50\text{mm}$). This gives a huge advantage, especially for in situ-measurements and industry-related studies. To fit this needs, the instrument will have two guide systems for thermal and cold neutrons. This way, powder diffraction is not compromised by the small angle and imaging option, but all have

the best beam optics and the best performance possible. The instrument layout is shown in Figure 1, the different operation modes possible by the two guides (thermal and cold) and the different detectors are illustrated in Figure 2.

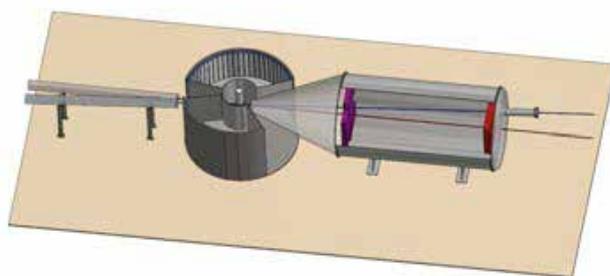


Figure 1: Layout of the instrument HEIMDALLR proposed for ESS in Lund. The central powder diffractometer is supplemented by a SANS option and imaging camera.

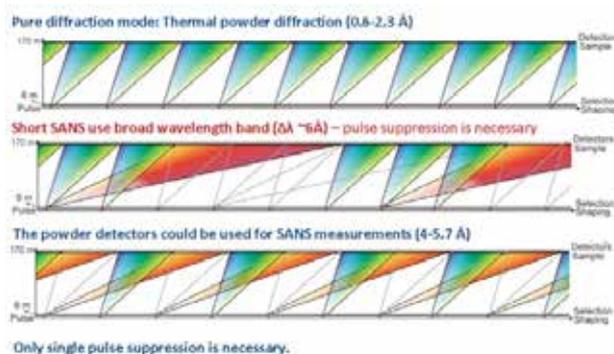


Figure 2: Different operation modes of the HEIMDALLR instrument. The figures shows the distance of the neutron from the source (vertical axis) as a function of time of flight (horizontal axis). The neutrons from the thermal guide are in green, the neutrons from the cold guide in red. Pure powder diffraction (top, main mode), short SANS and powder diffraction (center) and narrow band SANS (bottom). The instrument length is around 170m (source to sample).