



Contribution ID: 502

Type: Poster

Multi-Incident-angle Neutron Reflectometer with Focusing Optics at SOFIA (J-PARC)

Monday 20 March 2023 16:00 (2 hours)

SOFIA is the horizontal-type neutron reflectometer at Beamline 16 (BL16) of the Materials and Life Science Experimental Facility (MLF) of the Japan Proton Accelerator Research Complex (J-PARC). Allowing users to keep the sample horizontal while measuring the whole q -range, SOFIA is advantageous for observing liquid-vapor and liquid-liquid free interfaces. Thus, SOFIA is, by and large, utilized for investigating soft matters. The required data acquisition time for sufficient statistics at SOFIA is relatively short, owing to the highest intensity of the beam in the world from J-PARC (as of today), and to the efficient measurement with the pulsed beam and Time-of-Flight method. On the other hand, its accessible Q_z range is limited by the wavelength band. The current setup of SOFIA requires three to four points of angle scan to cover the dynamic range of reflectivity from 1 to 10^{-6} - 10^{-7} , which corresponds to the Q_z range from a little less than 0.1 nm^{-1} to $1.5\text{--}4 \text{ nm}^{-1}$.

To enhance the performance of SOFIA, especially for time-slicing measurements, we are upgrading to a Multi-Incident-angle Neutron Reflectometer (MI-NR) with a combination of focusing optics. With this setup, we could cover the range of $0.09 \leq Q_z [\text{nm}^{-1}] \leq 3.3$ with a single shot with an enhanced beam intensity.

In the presentation, the details of the upgrade concept and the progress status of commissioning will be presented.

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Session Classification: Poster Session MONDAY

Track Classification: Neutron Instrumentation, Optics, Sample Environment, Detectors, and Software