

Development of a white beam supermirror focusing optics for neutrons

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While most neutron experiments use neutron beams with a typical size of some tens of squared centimeters, some instruments have to use sub-millimeter beams. This is the case when bigger samples are not available, like in single crystal bio-molecular diffraction, or as in high pressure diffraction, when sample environment constraints require a high intensity on a small sample, with a low background outside the sample area. The usual approach is to insert distant pinholes in the beam in order to limit the beam size and divergence, at the expense of flux. In these cases, focusing the beam from a larger pinhole down to the sample size with tailored mirror optics has clear advantages. The development of a double-mirror focusing optics for the future high pressure diffractometer SNAP at the Spallation Neutron Source (SNS), performed in collaboration between SNS and the Institut Laue Langevin, will be presented. The Ni/Ti supermirror coating, designed to reflect a large wavelength band, will be described together with the first characterization of the system on a monochromatic test reflectometer. As the interface quality is crucial in a supermirror stack, we are investigating the roughness evolution of Ni during growth with in-situ X-ray scattering, according to the growth conditions. Depending on the progress made in this study, results of these measurements will be presented.

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