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Small-angle neutron scattering, reflectometry, and diffractometry using proton-polarized samples

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Scattering length neutrons for cold protons remarkably depends on relative direction of their spins. Thus, scattering pattern of polarized neutrons varies as a function of proton-polarization (P_H) of samples. This technique called spin-contrast-variation (SCV) enables us to determine detailed structure of composite materials from the P_H-dependent multiple scatterings.
Since Stuhrmann et al. firstly demonstrated in 1989, the SCV technique has been applied to small-angle neutron scattering (SANS) measurements. We have also carried out SCV-SANS measurements of variety of samples in Japan Research Reactor (JRR-3) and Japan Proton Accelerator Research Complex (J-PARC). Recently, we newly applied the SCV technique to neutron reflectometry to study surface and interface structure of multilayered thin-films. Now, we are developing SCV neutron powder diffractometry to determine polycrystalline structure.

Summary

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