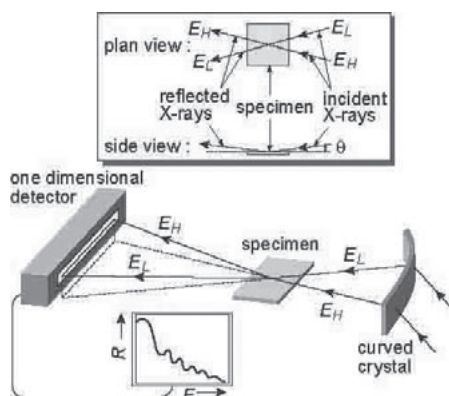


specimen placed at the focus in a geometry that the glancing angle in the vertical direction is the same for all the X-ray components, and they are reflected in the vertical direction by the surface and diverge in the horizontal plane. The perpendicular momentum transfer, given by $q=4\pi\sin\theta/\lambda$, continuously changes as a function of the ray direction even with the fixed glancing angle θ since the wavelength (energy) λ changes. The X-ray intensity distribution across the beam direction measured downstream of the specimen using a one-dimensional detector represents the X-ray reflectivity curve. Some results of static and dynamic measurements will be reported, and the characteristics and potentials of the method will be discussed.



Keywords: specular X-ray reflectivity, time-resolved, simultaneous multiwavelength dispersive

MS.02.3

Acta Cryst. (2008). A64, C17

Structural characterization using the multiple scattering effects in GISAXS

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The multiple scattering effects present in grazing-incidence small-angle X-ray scattering (GISAXS) data and interference between them are addressed theoretically as well as experimentally with measurement of a series of patterns at different incident angles, referred to as 'incident-angle-resolved GISAXS' (IAR-GISAXS). X-ray reflectivity (XR), GISAXS and IAR-GISAXS of virus particles on Si-substrate supported-polystyrene films have been measured and compared. It was found that under certain conditions it is possible to extract the correct structural features of the materials from the GISAXS/IAR-GISAXS data using the kinematic SAXS formalisms. Furthermore, the Kiessig fringes in GISAXS enable the measurement of the average distance between the particle and the substrate, similar to the measurement of film thickness using the fringes in the XR data.

Acknowledgements
This work benefited by the use of the APS and other facilities at the Argonne National Laboratory supported by the US Department of Energy, Office of Science, Office of Basic Energy Sciences, under Contract No. DE-AC02-06CH11357.

Keywords: GISAXS, reflectivity, virus assembly

MS.02.4

Acta Cryst. (2008). A64, C17

Neutron reflectively study of chain conformation in polyelectrolyte brushes at the liquid interface

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The zwitterionic and cationic polyelectrolyte brushes on the quartz plates were prepared by surface-initiated atom transfer radical polymerization of 2-methacryloyloxyethyl phosphorylcholine (MPC) and N,N-dimethylaminoethyl methacrylate, which was successively converted to methacryloyloxyethyl trimethylammonium iodide (META1) by quaternization with methyl iodide. Neutron reflectivity (NR) was measured by irradiation of neutron beam from the quartz plate to the interface between liquid phase and immobilized polyelectrolyte brush. NR profiles of polyelectrolyte brush/D₂O interface indicated that the polymer chains exhibited stretched conformation and formed concentration gradient of D₂O under swelling states. The effects of ionic strength on the conformation and surface properties of densely grafted polyelectrolyte brush were analyzed by NR. The difference between reflectivity of polyelectrolyte brushes in D₂O and in salt solution was negligible. The authors supposed that quaternary ammonium iodide at the side chain of poly(META1) chains are bulky and the mobility of iodide ion is limited because of weak hydration. On the other hand, PMPC brush slightly shrunk at the EtOH/Water in cononsolvency region.

Keywords: polymer brush, water interface, polyelectrolyte

MS.02.5

Acta Cryst. (2008). A64, C17-18

Following growth and catalytic reaction of oxide supported metal nanoparticles with GISAXS

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X-ray scattering techniques using the grazing incidence geometry offer the opportunity to probe in situ the crystallographic structure and the morphology of metal nanoparticles grown on oxide planar surfaces. Combining wide angle (GIXD) and small angle scattering (GISAXS) can give some insights into connected thermodynamic and kinetic parameters of metal/support interface, namely the role of stress due the lattice mismatch on the epitaxial orientation, the adhesion/wetting properties, the particle equilibrium shape and the peculiarities of the growth modes and the chemical reactivity. One key advantage of X-ray is the capability to perform measurement not only during particle growth under vacuum conditions but also at high pressure during the course of an actual catalytic reaction. This will be illustrated with our recent results on Au/TiO₂(110), a model planar system of gold-based catalyst. Among others, the following points will be discussed: