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ASAXS of layered silicate clays containing Ni(II) and Er(III)

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Anomalous SAXS data were collected at BL 4-2 at SSRL for two systems important to materials chemistry that are based on layered silicate clay frameworks. These studies concern the synthesis of heterogeneous catalysts and the dynamics of heavy metals in trapping media.

The nickel system represents the first *in situ* ASAXS examination of catalyst synthesis. SAXS data were measured at 5 different energies near the the K edge of Ni (8100, 8330, 8338, 8342, and 8344 eV) for three different reaction times: unreacted, 4 hours (an intermediate stage), and 15 hours, when the crystallization is essentially complete. The SAXS signals for the unreacted sample showed no correlations for a lameller particles. On the other hand, the sample reacted for 4 hrs indicated the evolution of lamella, and the crystallized sample (15 hrs) exhibits much larger lameller correlations. Systematic variations are seen in the ASAXS data for the 4 hr and 15 hr samples measured near the K edge of Ni, indicating that these variations are due to the anomalous scattering from the ordered Ni atoms in the layered silicates.

The erbium study provides the first scattering measurements of heavy metal ion solvation and migration in clays, which has implications to both catalysis and environmental issues. The SAXS data show that the layer spacing in the diffraction patterns increases upon hydration. Systematic energy dependent variations in the SAXS signals near the L_{III} edge of Er are observed. Further analysis is underway to extract the partial structure factors of the labels for both systems.