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Small And Wide-Angle Scattering At Chemmatcars: Bridging The Gap Between 'Ideal' And 'Real' Materials. D.J. Cookson[1], M. Lee[2], D. Schultz[2], [1]Australian Synchrotron Research Program, [2]Consortium for Advanced Radiation Sources (CARS), Univ. of Chicago, Chicago 60637.

For detailed structural information at an atomic scale, the ideal solid sample is arguably a single un-twinned crystal. While this is desirable for studying sub-molecular structure, many useful and important materials in real life exist somewhere between a crystalline and amorphous state. In addition, many materials possess different types of structure on different length scales – superimposing a richness of variation in physical properties that can modify or transcend the chemistry of the component molecules.

The small and wide angle x-ray scattering (SAXS/WAXS) facility at the ChemMatCARS sector of the Advanced Photon Source (APS) is used to study liquids and solids on length scales ranging from 1 to 1000 Å.

The high intensity of the APS undulator radiation has allowed researchers to follow dynamic processes using SAXS exposure repetition rates of a few seconds. Molecular self-assembly and micro-crystallization in liquid environments have been studied, along with real-time *in-situ* processing of various polymers. The brilliance of the x-ray beam has also allowed users to obtain good data from small volume samples such as single filament fibers.

A number of examples of work done at the ChemMatCARS facility will be presented, demonstrating how complementary x-ray scattering techniques such as SAXS and WAXS can extend our understanding of materials from the atomic to the macroscopic scale.