Resonant Soft X-ray Scattering for Soft Materials

CHENG WANG, ATHONY YOUNG, ALEXANDER HEXEMER, HOWARD PADMORE, Lawrence Berkeley National Laboratory — Over the past few years, we have developed Resonant Soft X-ray Scattering (RSoXS) and constructed the first dedicated resonant soft x-ray scattering beamline at the Advanced Light Source, LBNL. RSoXS combines soft x-ray spectroscopy with x-ray scattering thus offers statistical information for 3D chemical morphology over a large length scale range from nanometers to micrometers. Its unique chemical sensitivity, large accessible size scale, molecular bond orientation sensitivity with polarized x-rays and high coherence have shown great potential for chemical/morphological structure characterization for many classes of materials. Some recent development of in-situ soft x-ray scattering with in-vacuum sample environment will be discussed. In order to study sciences in naturally occurring conditions, we need to overcome the sample limitations set by the low penetration depth of soft x-rays and requirement of high vacuum. Adapting to the evolving environmental cell designs utilized increasingly in the Electron Microscopy community, customized designed liquid/gas environmental cells will enable soft x-ray scattering experiments on biological, electro-chemical, self-assembly, and hierarchical functional systems in both static and dynamic fashion. Recent RSoXS results on organic electronics, block copolymer thin films, and membrane structure will be presented.

Cheng Wang
Lawrence Berkeley National Laboratory

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