Workshop 6: Polarized Resonant Soft X-ray Scattering at NSLS-II wrapup.

The PRSoXS workshop at the 2017 NSLS-II CFN Users meeting showcased the successes and future potential of PRSoXS impacting fields from advanced materials to biology. Although the half-day format allowed for only 15 minutes per talk, excitement and interest of the community was excellent with 64 total attendees. These attendees hailed from National Labs (21 from Brookhaven and 6 from Berkeley Lab), NIST (9), and Academia (19), and included several attendees from the Airforce Research Laboratory (3) and Industry (6). The speakers gave an impressive range of talks about the future of RSoXS. Eliot Gann, of NIST, started out the program by introducing NIST's plan for a new PRSoXS capability with unprecedented signal to noise detection and both high throughput and in-situ environments as part of SST, one of NIST's suite of beamlines at NSLS which will be coming online in the next year. Cheng Wang, of the Advanced Light Source, gave an update of RSoXS at the ALS, the first and single most productive RSoXS facility in the world, with its continually increasing number of publications (75 in 2016) despite having to alternate beamtime with another endstation. From NIST, the head of nSoft, Ron Jones, gave an excellent introduction to reaching out to industry. nSoft is a NIST-lead industry consortium for neutron scattering, although Ron Jones is now expanding his role to encompass NIST's efforts at the NSLS-II including its push for RSoXS.

Kicking off a more technical set of talks about recent successes of the RSoXS technique and where we can improve, Long Ye from the Ade Research group at North Carolina State University presented his recent work utilizing resonant soft X-ray scattering. He found that the device performance of printed nonfullerene organic solar cells depends strongly on the characteristics of smallest domains, exemplifying how PRSoXS can aid in the future design and optimization of new non-fullerene organic solar cells that that improve device efficiency while also exceeding environmental and health safety standards. Following this, the only grad student presenter of the workshop, Eunhee Lim of the Chabinyc research group at the University of California Santa Barbara, presented an engaging talk on her developments utilizing new doping methodologies to examine organic electronics in excited states. Next, Professor Enrique Gomez of Pennsylvania State University presented an outlook at using RSoXS to examine biologically relevant materials, enabling a new tool for the vibrant Biological research community who will be able to use RSoXS to examine nanoscale structure and molecular alignment once environmental measurement cells, like those being built at the new NSLS-II beamline, become available. As the final talk before the break, Professor Brian Collins, of Washington State University, showed his group's recent efforts to quantify PRSoXS data, and the amazing levels of information one can obtain by doing so, even precisely measuring the alignment and thickness of interfacial regions between nanoscale domains.

Following the break, the morning continued with Jeff Kortright of Lawrence Berkeley National Lab presenting his recent work in quantifying the precise degree of backbone folding which occurs in polymers. Part of this work considered the levels of depolarized scattering and fluorescence backgrounds that must be considered to obtain accurate detailed results from PRSoXS patterns. Alex Hexemer from the Advanced Light Source then impressed the attendees with his recent progress, as part of the CAMERA initiative from Berkeley Lab, in developing a powerful (with the option to seamlessly use a supercomputing for the backend) flexible (with optimized routines for scattering, spectroscopy and tomography data) user interface for analysis of synchrotron data, called XiCAM. NIST's Joe Kline then presented resonant CD-SAXS, a technique using RSoXS to fit the line grating shape of a next generation lithographic features. This was followed by Dan Sunday, also from NIST, who presented the

applications of Resonant Soft X-ray Reflectivity in obtaining highly accurate depth dependent spectroscopic information of complex thin films. Finally the Air Force Research Lab send Nicholas Bedford to present a project to use RSoXS to analyze antibodies in biosensors, which can actively monitor fatigue levels in pilots.

Discussions continued well into the afternoon, during a tour of the future location of NIST's RSoXS facility as the excitement of this developing and broadening community of resonant X-ray scatterers was indefatigable. We would like to offer a sincere thanks to all the presenters and attendees who made our workshop a great success!