

The *In Operando* Spin Coating Capability at Beamline 8-ID-E of the Advanced Photon Source

Joseph Strzalka, X-Ray Science Division
Argonne National Laboratory

Spin casting from solution is a ubiquitous and commercially important process for fabricating uniform, homogeneous polymer thin films. It is widely used in organic photovoltaic research, including the fabrication of the champion organic devices tracked in the NREL chart of Best Research-Cell Efficiencies, which significantly outperform devices manufactured by more scalable processes. Addressing this performance gap requires a better understanding of processing at both industrial and laboratory scale. In order to enable *in operando* Grazing-Incidence X-Ray Scattering studies of spin casting, we have developed at Beamline 8-ID-E a stable and robust spin coating sample environment for general use. Based on an air bearing spindle motor, the spin coater achieves rotational velocities up to 4000 rpm with only minimal angular broadening and can accommodate silicon wafers up to 100 mm in diameter in an inert atmosphere. Sample injection is automated and does not obstruct the field of view. A commercial optical reflectance instrument monitors the evolution of sample thickness during the spin-coating process. A tandem undulator source, vertically focused beam and the fast-framing capability of the Pilatus 1M detector allow temporal resolution of about 10 ms. Examples of *in operando* measurements in GISAXS and GIWAXS geometries will be presented. The spin coating sample environment is now available for General Users.