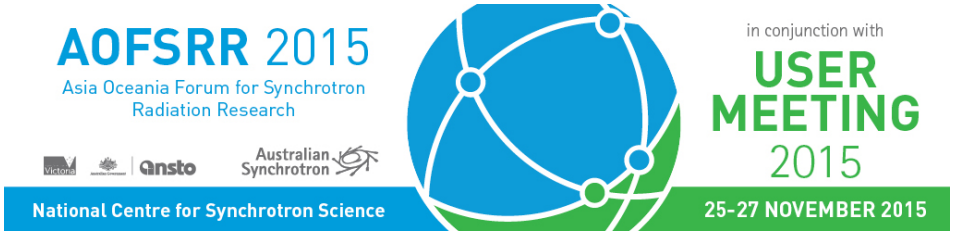

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Observation of crystalline orthogonal self-stratification in spin-coated conjugated polymer thin films with depth-sensitive X-ray scattering

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We report the observation of an orthogonally realigned crystalline surface layer in a spin-coated conjugated polymer film as used in organic field-effect transistors. The ability of Grazing Incidence Wide Angle X-ray Scattering to provide some surface sensitivity of scattering features within thin films is known, but until now an unambiguous orthogonal stratified crystalline microstructure in high performance polymeric materials has not been demonstrated. By comparing angle-resolved scattering intensity collected at the SAXS/WAXS beamline of the Australian Synchrotron to simulated X-ray electric field intensity within a 72 nm thin polymer film, we find the data is consistent with 9 nm of edge-on aligned crystallites on top of 63 nm of highly crystalline face-on crystallites. We propose that a balance of air-polymer, polymer-polymer, and substrate-polymer interactions encourage edge-on surface realignment and stratification. This type of surface reorganization and alignment will be increasingly important to measure and predict as further organic electronic devices are developed.

Keywords

Scattering, Depth Sensitivity, GIWAXS, Crystalline Stratification

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