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Polarization Depend Soft X-ray Scattering of Anisotropic Organic Thin Films[1] H. ADE, E. GANN, B. COLLINS, H. YAN, NCSU, J. COCHRAN, M. CHABINYC, UCSB — Crystalline, semi-crystalline and liquid-crystalline organic materials have locally large anisotropic bond orientation statistics. This strongly impacts the mechanical, optical and electronic properties. For example, charge transport in organic thin films is often highly anisotropic and overall transport depends upon domain size, degree of order within domains, domain correlations, and the domain boundaries. Knowing the relative impact of all parameters is necessary for a detailed understanding of organic thin film transistors. - We demonstrate a novel scattering method to characterize such films: Polarization Dependent Soft X-ray Scattering (P-SoXS). In scattering, the linear dichroic absorption often exploited in x-ray microscopy is accompanied by strong linear dichroic dispersion, leading to large contrast based on bond orientation. This can not be achieved with hard x-rays or neutrons. We demonstrate P-SoXS on devices based on prototypical materials such as pentacene, poly(2,5-bis(3-tetradecyllthiophen-2-yl)thieno[3,2-b]thiophene) (pBTTT) and poly(3-hexylthiophene) (P3HT). The use of linear or circularly polarized x-rays allows the bond orientation contrast to be switched on and off, respectively, which is very useful to characterize the correlated and individual domain size.

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