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Microstructure of High Performance Polymer Electronics

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Conjugated polymers are an interesting class of material whose semiconducting properties enable application in light-emitting diodes, polymer solar cells and organic field-effect transistors (OFETs). The molecular packing and microstructure of conjugated polymer thin films strongly influences the function of such electronic devices. Due to the semicrystalline nature of conjugated polymers, characterisation of the thin film microstructure can be challenging, especially when films less than 100 nm thick are used. For OFETs in particular charge transport is localised to within a ~ 3 nm thick accumulation layer at the film interface, requiring characterisation techniques that are highly surface sensitive. In this presentation I will overview the application of synchrotron-based techniques such as Near-Edge X-ray Absorption Fine-Structure (NEXAFS) spectroscopy and Grazing-Incidence Wide-Angle X-ray Scattering (GIWAXS) to disclose the microstructural signatures of high performance polymers that enable large-area MHz electronics.

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