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Using NEXAFS spectroscopy to probe the Biaxial Orientation of a Pyridal[2,1,3]thiadiazole-containing Donor-Acceptor Polymer
SHRAYESH PATEL, GREG SU, CHAN LUO, MING WANG, ALAN HEEGER, GUILLERMO BAZAN, MICHAEL CHABINYC, EDWARD KRAMER, UC Santa Barbara; Mitsubishi Chemical - Center for Advanced Materials — Near Edge X-ray Absorption Fine Structure (NEXAFS) spectroscopy is a powerful tool to probe the molecular orientation of conjugated polymer thin films. Here, we report on the biaxial orientation of a high mobility donor-acceptor copolymer coated on uniaxial nanogrooved substrates. The polymer system under investigation is regioregular PCDTPT based on cyclopenta[2,1-b:3,4-b']dithiophene (CDT) and pyridal[2,1,3]thiadiazole (PT) structural units. In partial electron yield mode, NEXAFS spectroscopy is a surface sensitive technique ($\sim 2\text{-}3$ nm). This is particularly useful as we are interested in probing the orientation near the interface between the polymer and the substrate. While the carbon K-edge is commonly used for NEXAFS experiments, we can take advantage of the PT unit and use the nitrogen K-edge to probe the biaxial orientation of our films. We will present the biaxial orientation of films coated on substrates with and without uniaxial nanogrooves. The results indicate that the presence of uniaxial nanogrooves are important in obtaining films with high level of orientation. Lastly, anisotropic field-effect transistor mobility values will be presented for various coating conditions.

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