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Temperature Controlled Electrostatic Disorder and Polymorphism in Ultrathin Films of α-Sexithiophene[1] BENJAMIN HOFFMAN, SARA JAFARI, North Carolina State Univ, TERRY MCAFEE, Tulane University, AUBREY APPERSON, BRENDAN O'CONNOR, DANIEL DOUGHERTY, North Carolina State Univ — Competing phases in well-ordered alpha-sexithiophene (α-6T) are shown to contribute to electrostatic disorder observed by differences in surface potential between mono- and bi-layer crystallites. Ultrathin films are of key importance to devices in which charge transport occurs in the first several monolayers nearest to a dielectric interface (e.g. thin film transistors) and complex structures in this regime impact the general electrostatic landscape. This study is comprised of 1.5 ML sample crystals grown via organic molecular beam deposition onto a temperature controlled hexamethyldisilazane (HMDS) passivated SiO_2 substrate to produce well-ordered layer-by-layer type growth. Sample topography and surface potential were characterized simultaneously using Kelvin Probe Force Microscopy to then isolate contact potential differences by first and second layer α-6T regions. Films grown on 70C, 120C substrates are observed to have a bilayer with lower, higher potential than the monolayer, respectively. Resulting interlayer potential differences are a clear source of electrostatic disorder and are explained as subtle shifts in tilt-angles between layers relative to the substrate. These empirical results continue our understanding of how co-existing orientations contribute to the complex electrostatics influencing charge transport.

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