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Nanoscale manipulation and conduction anisotropy in oligothiophene monolayers, a CS-AFM study FLORENT MARTIN, BAS HENDRIKSEN, ALLARD KATAN, MIQUEL SALMERON, Materials Science Division, LBNL, NENAD VUKMIROVIC, LING-WANG WANG, Computational Research Div,LBNL, CLAYTON MAULDIN, JEAN FRECHET, Chemistry, UC Berkeley — We used Langmuir-Blodgett organic monolayers on SiO2/p+Si as a model system to study the relationship between molecular order and conductivity in organic materials. Local manipulation of the polycrystalline monolayer by the AFM tip provided clear proof of the correlation between in plane conduction and crystalline order in the monolayer. Lattice resolution AFM imaging was used to show how scanning at high load with the AFM tip could irreversibly modify the molecular packing in the monolayer and decrease its conductivity. In addition, by combining CS-AFM and high resolution AFM, we found evidence for a conduction anisotropy caused by the asymmetry of the herringbone packing of the monolayer. Molecular dynamics calculations confirmed the crystal structure determined by AFM as well as the direction of higher conduction found experimentally.

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