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Structural Characterization of a Molecular Junction by X-ray Reflectivity JULIAN BAUMERT, Brookhaven National Laboratory, MICHAEL LEFENFELD, Columbia University, ELI SLOUTSKIN, Bar-Ilan University, PETER PERSHAN, Harvard University, MOSHE DEUTSCH, Bar-Ilan University, COLLIN NUCKOLLS, Columbia University, BEN OCKO, Brookhaven National Laboratory — In the field of molecular electronics, the nature and pathways of charge transfer through molecules is among the most intensely studied open questions. Experimental studies, employing both single molecules and self-assembled monolayers attached to the electrodes, have demonstrated that the electronic characteristic of these junctions is difficult to reproduce. We report x-ray reflectivity studies of the structure of organic mono- and bi-layers self-assembled between two conducting electrodes: silicon and mercury. At high molecular coverage, the Angstrom resolution high-energy synchrotron x-ray measurements reveal densely-packed layers of roughly interface-normal molecules. The interface normal structure is stable and relatively insensitive to electric fields when a voltage is applied across the junction. Furthermore, our x-ray studies reveal that variation of the molecular coverage of the electrodes influences the structure and quality of the molecular junctions.

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