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Structure and Morphology of Copper Phthalocyanine Films on Graphene and Graphite TERRY MCAFEE, TIANSHUAI GUAN, SEAN STEWART, ELIOT GANN, JACK ROWE, HARALD ADE, DANIEL DOUGHERTY, North Carolina State University — Indium tin oxide (ITO) is the most widely used anode in organic photovoltaic (OPV) applications. It has several disadvantages, including elemental scarcity and a very rough surface morphology that influences the structure of organic thin film active layers. Alternative transparent conducting anode materials must be identified for use in organic optoelectronic devices. An exciting possibility is the use of graphene since it offers high performance electrical characteristics, good transparency, and a very flat template for high quality film growth. Hard x-ray scattering reveals a "face-on" orientation of copper phthalocyanine (CuPc) on graphene, in contrast to its "edge-on" orientation on ITO. This is advantageous for solar cells due to enhanced absorption as well as improved charge transport to the anode via pi-pi stacking. Atomic force microscopy shows that CuPc forms large crystalline domains on graphene that should improve carrier mobility, as well as increase the exciton diffusion length leading to improved charge separation. These unique characteristics suggest significantly improvements in the Jsc and FF of CuPc based OPV devices using graphene as an anode material.

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