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Porphyrin Molecular Multilayer Thin-Films on Gold (111) Electrodes for Electro-optical Applications ALEXANDRA KRAWICZ, Chemistry Department, RPI, GUOGUANG QIAN, KIM LEWIS*, Physics Department, RPI, PETER DINOLFO*, Chemistry Department, RPI — We have developed a Layer-by-Layer (LbL) method for the fabrication of thin-film molecular multilayers on gold (111) electrodes. Copper(I) catalyzed azide-alkyne cycloaddition (CuAAC) coupling reactions were used for surface attachment and subsequent LbL deposition of porphyrin building blocks. The electrochemical and photophysical properties of the thin-films can be tuned through synthetic modification of the individual components, resulting in new porphyrin multilayers for applications in light harvesting and molecular electronics. Herein, we demonstrate the reproducible growth trends and optical properties of these films. Multilayer growth was followed by UV-Vis absorption and reflectance spectroscopy. Film thickness (FT) and optical constants were obtained from spectroscopic ellipsometry. Topology and surface roughness was examined by TM-AFM, while the copper content was quantified by XPS. The redox characteristics were studied by electrochemical methods, whereas the conductance of individual porphyrin constructs was examined by STM using the molecular break junction method. The multilayers show consistent linear growth in absorbance and FT over tens of layers and continuity in their molecular structure.

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