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**Synthesis and Local Characterization of a Porphyrin-based Single-layer Covalent Organic Framework** TRINITY JOSHI, CHEN CHEN, University of California, Berkeley, HONG LI, HUIFANG LI, King Abdullah University of Science and Technology, ANTON D. CHAVEZ, Northwestern University, ZAHRA PEDRAMRAZI, University of California, Berkeley, JEAN-LUC E. BREDAS, King Abdullah University of Science and Technology, WILLIAM R. DICHTEL, Northwestern University, MICHAEL F. CROMMIE, University of California, Berkeley — Covalent organic frameworks (COFs) form stable 2D networks that have possible applications in areas such as molecular electronics, catalysis, and gas storage. Here we report the synthesis and characterization of a porphyrin-based single layer 2D COF having a square lattice with a core-linker configuration. Our method for synthesizing this COF involves vapor-depositing two different species of molecular precursors onto the surface of a Au(111) crystal: a porphyrin core molecule (5,10,15,20- Tetrakis (4-aminophenyl) porphyrin, or TAP) and a small linker molecule (2,5-dimethoxybenzene-1,4-dicarboxaldehyde, or DMA) that connects the cores. Annealing these molecules on Au(111) causes the core and linker molecules to covalently bond through a Schiff base condensation reaction to form the COF. We have explored the resultant COF local structure and local electronic properties using scanning tunneling microscopy (STM) and spectroscopy (STS). We report an experimental band gap of 1.98eV for this COF system and we observe that the conduction band minimum and valence band maximum states are primarily localized to the porphyrin core.

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