

Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Molecule-resolved structural and electronic properties of diamondoid self-assembled monolayers¹ JASON C. RANDEL², HARI C. MANOHARAN³, Stanford University — Diamondoids represent an exciting new direction in the field of nanoscale carbon. While theoretically known to be stable, diamondoids have been experimentally inaccessible due to synthesis roadblocks and lack of natural sources, until recently purified from crude oil. We investigate the local structural and electronic properties of self-assembled monolayers formed from thiol-functionalized diamondoids. Using an ultra-high vacuum scanning tunneling microscope, we observe these monolayers to be robust and stable up to room temperature. Topographic data demonstrate well-ordered lattices for all molecules studied (adamantane through tetramantane), with lattice constants and angles that vary with polymantane order. Tunneling spectroscopy reveals a conductance gap in the energy spectra of each molecule, which we compare to calculated HOMO-LUMO gaps and band alignments. The hierarchical nature of these molecules, and the ability to functionalize them with specific atomic and molecular end groups, provide a new set of customizable molecular nanomaterials.

¹Performed in collaboration with J. E. P. Dahl, R. G. Harris, and M. J. Preiner. This work was supported by DOE, ONR, and NSF.

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Date submitted: 16 Nov 2006

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