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Electronic structure and electron-phonon coupling in carbon diamondoids studied by scanning tunneling microscopy YAYU WANG, X.H. LU, R. YAMACHIKA, A. WACHOWIAK, E.S. KIOUPAKIS, S.G. LOUIE, M.F. CROMMIE, Department of Physics, University of California at Berkeley, Materials Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA, J.E. DAHL, S.G. LIU, R.M.K. CARLSON, MolecularDiamond Technologies, Chevron-Texaco Technology Ventures, CA — Diamondoids are hydrocarbon molecules with diamond-like cage structures. Their structural complexity and chemical bond tunability make them ideal building blocks for creating novel nanostructures. We have used cryogenic scanning tunneling spectroscopy to examine the electronic structure of individual diamondoid molecules on the Au(111) surface. We observed variations in the filled and empty state local density of states for individual 121-tetramer diamondoid molecule. Despite a large HOMO-LUMO gap (Δ $>$ 5eV) around the Fermi energy, there exists a strong interaction between the tunneling electrons and the diamondoid C-H stretch mode, as revealed by inelastic tunneling spectroscopy (IETS). We further show that the strength of the electron-phonon coupling has a distinct spatial distribution with the dominant inelastic channel localized to a specific region of the diamondoid molecule.

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