Abstract Submitted
for the NWS17 Meeting of
The American Physical Society

Confinement of Electrons to Carbon Nanohoop Quantum Corrals on Metal Surfaces[1] BENJAMEN TABER, CHRISTIAN GERVASI, JON MILLS, DMITRY KISLITSYN, EVAN DARZI, WILLIAM CROWLEY, RAMESH JASTI, GEORGE NAZIN, University of Oregon — Quantum confinement of two-dimensional surface electronic states is a potential avenue for controllable modification of metal surface electronic structure. We present real-space scanning tunneling microscopy/spectroscopy (STM/STS) investigations of electronic confinement within individual ring-shaped cycloparaphenylene (CPP) molecules forming self-assembled films on Ag(111) and Au(111) surfaces. STM imaging and STS mapping show the presence of electronic states localized in the CPP interiors, inconsistent with the expected localization of molecular electronic orbitals. These observations are explained by the presence of localized states formed due to confinement of surface electrons by the CPP skeletal framework, which thus acts as a molecular electronic "corral". We used a particle-in-an-elliptical-box (PIAEB) model to describe the confined surface states, correlating molecular eccentricity and confined surface state energy. These results suggest a route for controllable and scalable modification of surface electronic structure.

[1]National Science Foundation (CHE-1454036)

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Date submitted: 02 May 2017 Electronic form version 1.4