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Spatially-resolved molecular Quantum Dots at the Surface of a Gated Graphene Device HSIN-ZON TSAI, SEBASTIAN WICKENBURG, UC Berkeley physics/ LBNL, JIONG LU, UC Berkeley physics/ NUS Graphene Research Centre, ARASH A. OMRANI, SINISA COH, HAN SAE JUNG, DILLON WONG, JOHANNES LISCHNER, RAMIN KHAJEH, UC Berkeley physics, ALEXANDER RISS, UC Berkeley physics/ TU Wien applied physics, AARON J. BRADLEY, UC Berkeley physics, ERIK PIATTI, Politecnico di Torino DISAT, ALEX ZETTL, STEVEN G. LOUIE, MARVIN L. COHEN, MICHAEL F. CROMMIE, UC Berkeley physics/ LBNL MSD — The ability to modify the electronic properties of monolayer graphene via charge-donating or charge-accepting molecules creates new opportunities for fabricating nano-scale hybrid devices. Understanding the charge transfer process at the single molecule level is essential for tuning the electronic and magnetic characteristics of such hybrid devices. We have used scanning tunneling microscopy (STM) to locally probe how different molecular assemblies (including single molecules, molecular chains, and 2D molecular islands) exchange charge with a graphene substrate as the device backgate voltage is varied. Different molecular configurations exhibit substantially different charging behavior - some are permanently charged while others can be controllably ionized using the device backgate. Electrostatic interactions lead to charge heterogeneity at the molecular level. Single-chemical-bond-resolved atomic force microscopy allows us to correlate chemical structure and adsorption geometry of the molecules with their electronic properties.

Hsin-Zon Tsai
UC Berkeley physics/ LBNL

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