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Gate-controlled modification of molecular electronic structure at the surface of graphene ALEXANDER RISS, SEBASTIAN WICKENBURG, HSIN-ZON TSAI, LIANG TAN, MIGUEL MORENO UGEDA, AARON BRADLEY, Department of Physics, UC Berkeley, ALEX ZETTL, STEVEN G. LOUIE, Department of Physics, UC Berkeley; Materials Science Division, Lawrence Berkeley National Laboratory, FELIX R. FISCHER, Department of Chemistry, UC Berkeley, MICHAEL F. CROMMIE, Department of Physics, UC Berkeley; Materials Science Division, Lawrence Berkeley National Laboratory — Understanding the behavior of adsorbed molecules on graphene is important for a variety of reasons, including the fact that they can potentially be used to modify the optical, electronic, catalytic, and magnetic properties of graphene devices. Here we show how gate-induced shifting of the Fermi level of a single graphene layer can be used to induce electronic changes in adsorbed molecules. We have used scanning tunneling microscopy and spectroscopy to characterize the structure and electronic properties of 3,3',3"-(Benzene-1,3,5-triyl)tris(2-cyanoacrylonitrile) (BTC) molecules adsorbed onto the surface of a back-gated graphene device. We observe that the energy (with respect to the Fermi level) of the lowest unoccupied molecular orbital (LUMO) of individual BTC molecules can be tuned by application of a gate voltage. These results show the potential to control the physical and chemical properties of adsorbates via electrostatic gating.

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