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Probing edge-localized states of graphene quantum dots on Co(0001) DAEJIN EOM, KWANG RIM, HUI ZHOU, MICHAEL LEFENFELD, LI LIU, SHENGXIONG XIAO, COLIN NUCKOLLS, GEORGE FLYNN, TONY HEINZ, Columbia University — Two-dimensional graphene sheets of finite lateral extent are expected to show characteristic edge states at their boundaries. In particular, for zigzag edges, highly degenerate localized states have been predicted theoretically (Ref. 1) and probed by STM (Ref. 2). Such boundary effects are expected to be particularly prominent for nanometer-scale graphene quantum dots, structures for which the proportion of edge atoms is significant. In this paper we present investigations of graphene quantum dots that we have prepared by annealing carbon-bearing precursor molecules on a Co(0001) surface. Using scanning tunneling microscopy as a local probe of the physical and electronic structure, we report results on the nature of edge states for quantum dots of differing geometrical shape. We observed prominent edge-localized states for triangular quantum dots, whereas these features are suppressed for quantum dots of hexagonal shape. These observations are consistent with numerical simulations of the expected electronic structure. 1. M. Fujita et. al., J. Phys. Soc. Jpn. 65, 1920 (1996) 2. Y. Niimi et. al., Phys. Rev. B 73, 085421 (2006)

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