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Anomalous temperature-dependent shift in Fermi energy of epitaxial graphene on silicon carbide studied by photoluminescence spectroscopy and angle resolved photoemission spectroscopy SEBASTIEN LOUNIS, Graduate Group in Applied Science & Technology, UC Berkeley, DAVID SIEGEL, Department of Physics, UC Berkeley, ROBERT BROESLER, EUGENE HALLER, Department of Materials Science and Engineering, UC Berkeley, ALESSANDRA LANZARA, Department of Physics, UC Berkeley — Photoluminescence spectroscopy (PL) and angle resolved photoemission spectroscopy (ARPES) have been used to study the interaction between epitaxially grown graphene and the silicon carbide substrate. We report evidence of an anomalous temperature dependent shift of the Fermi energy with a maximum at 65K. At this temperature, a similarly anomalous onset of the photoluminescence spectra is observed. These results are explained by the formation of a Schottky barrier at the graphene/silicon carbide interface, which is also responsible for the large electron doping of epitaxially grown graphene films. Finally, we discuss how the interaction between incident photons and the Schottky barrier could potentially be harnessed for future optical applications based on our results.

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