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Electrical Properties of Overlapped Graphene Grain Boundaries Probed by Raman Spectroscopy RAHUL RAO, NEAL PIRCE, AVETIK HARUTYUNYAN, Honda Research Institute USA — The effect of grain boundaries and wrinkles on the electrical properties of polycrystalline graphene is pronounced. Here we investigate the stitching between grains of polycrystalline graphene, specifically, overlapping of layers at the boundaries, grown by chemical vapor deposition (CVD) and subsequently doped by the oxidized Cu substrate. We analyze overlapped regions between 60 – 220 nm wide via Raman spectroscopy, which reveals their structure to be AB–stacked bilayers. The Raman spectra from the overlapped regions are distinctively different from bilayer graphene and exhibit splitting of the G band peak. The degree of splitting, peak widths, and peak intensities depend on the width of the overlapped layer. We attribute these features to inhomogeneous doping by charge carriers (holes) across the overlapped grain boundaries via the oxidized Cu substrate. As a result, the Fermi level at the overlapped grain boundaries lies between 0.3 and 0.4 eV below the charge neutrality point. The dependence of charge distribution on the width of overlapping of grain boundaries may have strong implications for the growth of large-area graphene with enhanced conductivity.

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