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Epitaxial graphene: textbook non-interacting graphene

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Seamless multilayered epitaxial graphene layers are grown on the entire surface of SiC substrates by thermal decomposition of the SiC (000-1) C-face in a low vacuum induction furnace. This produces a new structure, consisting of a non-graphitic commensurate rotated stacking. This original layer stacking induces an effective decoupling of the layers, which preserves the integrity of the massless Dirac particles. This is experimentally demonstrated with linearly dispersing conical bands up to the Dirac point (ARPES), with the quantized Landau levels calculated for graphene (IR magneto-spectroscopy and scanning tunneling spectroscopy), a Berry's phase of pi, weak anti-localization and in the Raman spectra. Transport and spectroscopic measurements indicate high mobility, up to 250,000 cm2/Vs at room temperature. Epitaxial graphene can be patterned using standard lithography methods to define top and side- gated high mobility devices. Hundreds of transistors have been produced on a single mm2 size chip demonstrating the strong potential of multilayered epitaxial graphene for carbon-based electronic devices.