new developments in nanotechnology

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Single or few-layer graphene (FLG) sheets offer extraordinary electronic, thermal and mechanical properties and are expected to find a variety of applications. Fully exploiting the properties of graphene will require a method for the production of high-quality graphene sheets (almost pristine graphene) in large quantities. In this regard, we report a two-step method for obtaining a homogenous colloidal suspension of single or FLG sheets up to 0.15 mg ml^{-1} in N,N-dimethylformamide solution. The graphene nanostructures are directly imaged using a high-resolution transmission electron microscope (HRTEM) operated at 200 kV with a point resolution of 0.16 nm. We observed rotational misorientation within the flake in the HRTEM images of 2, 4 and 6 layers of graphene sheets, giving rise to Moiré patterns. By filtering in the frequency domain using a Fourier transform, we reconstruct the graphene lattice of each sheet and determine the relative rotation between consecutive graphene layers up, to six separate sheets. Direct evidence is obtained for FLG sheets with packing that is different to the standard AB Bernal packing of bulk graphite. Furthermore, we observed periodic ripples in suspended graphene sheets in our TEM measurements. Electrostatic force microscopy was used to characterize the electric potential distribution on the surface of FLG sheets on SiO_2/Si substrates in ambient conditions. The FLG sheets were found to exhibit a conducting nature with small potential variations on the surface.