Xingzhou Yan[1]
Jacob Amontree[1], Christopher DiMarco[1], Katayun Barmak[2], James Hone[1]
Department of Mechanical Engineering, Columbia University, New York, NY 10027, USA
Department of Applied Physics and Applied Mathematics, Columbia University, New York, NY 10027, USA
Xy2376@columbia.edu

Epitaxial ultraclean, wrinkle-free graphene growth on Cu(111) in an oxygen-free environment

Chemical vapor deposition (CVD)-derived graphene performance has shown to deteriorate with surface wrinkles, folds, and transfer-related contaminations. Towards the stitching-up phase of the graphene growth, the lack of active catalytic copper surface slows down the growth rate and leads to an excess of amorphous carbon formation. With the integration of an oxygen-free growth environment and a Cu (111) growth substrate; flat, clean, and intrinsic defect-free graphene can be reproducibly grown with an enhanced growth rate via low pressure CVD (LPCVD). The resulting sheet of graphene shows an epitaxial relationship with the substrate. Contamination-free graphene surface also enables clean transfer due to the absence of amorphous carbon and structural defects in the graphene sheet. Electrical measurements with h-BN encapsulation demonstrates carrier mobility comparable to exfoliated graphene, with ballistic transport characteristics at low temperature.

Figures

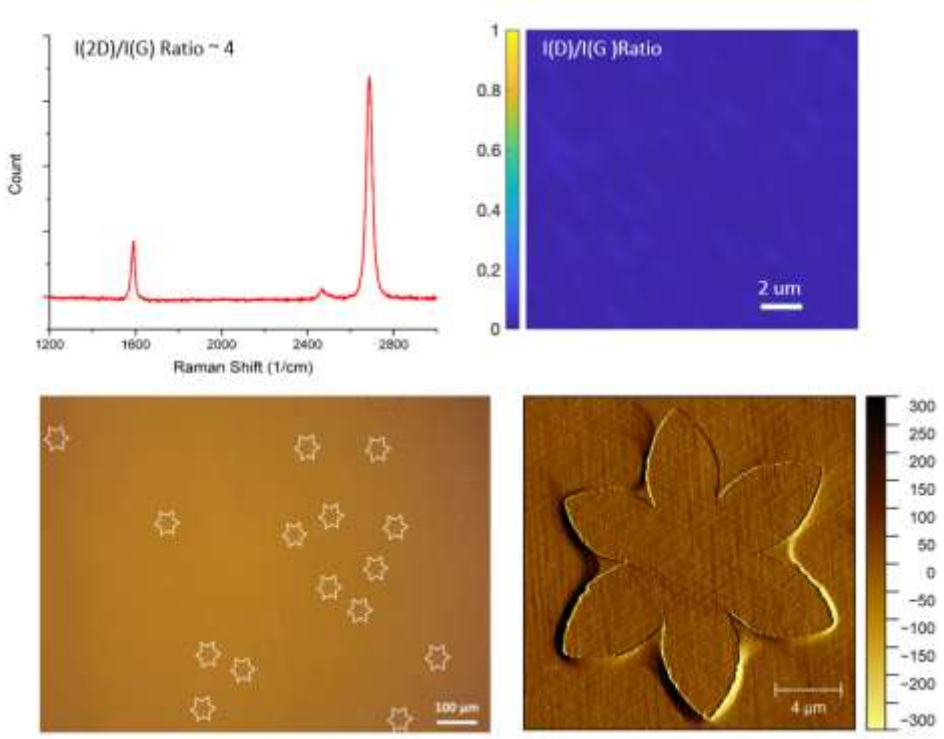

Figure 1
Graphene Raman characterization and grain alignment on Cu (111) substrate