

Graphene Processing for Electronics and Sensing

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The unique electronic properties of graphene of potential applications in future electronic devices. The quality of graphene layers is crucial for those applications, as contamination, impurities, morphology and defects can substantially affect the electronic properties and the performance of these devices. After numerous studies on hand grafted devices CVD growth of graphene yield macroscale samples, opening a pathway to reliably fabricate devices.

Graphene surfaces are ultra sensitive to local chemical environment due to changes in their electrical properties by vicinity doping of adsorbed molecules. Their chemical stability and lithographic manufacturability make them an appealing candidate for next generation biosensors. To exploit the full potential of graphene in sensing, however, selectivity to analytes must be established.

We present a comprehensive study on large scale CVD grown graphene films. Challenges faced in structuring graphene with conventional microfabrication techniques are discussed. Mild plasma treatments for cleaning graphene surfaces and novel hardmasks are introduced, leading reproducible devices with high field effect mobilities. With extensive analysis based on high resolution XPS, Raman spectroscopy and microscopy the metallicity, defect density and contaminations can be clearly identified. This work, therefore, will help high volume processing of graphene using these scalable processes steps, yielding interconnects, FET and sensor device arrays.