

Making Nano-Graphene

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In this talk, I will discuss new chemical strategies to synthesize graphene, from large area sheets to nanographene.

Majority of the solution-phase methods produce irregularly-sized and shaped graphene sheets due to the intrinsic randomness in the defect-mediated exfoliation or cutting process of the precursor graphitic flakes. To produce highly regular graphene nanostructures, a fabrication process that is driven by thermodynamics, as in crystal growth, should be more suitable than defect-mediated fragmentation processes. To this end, we will show how we apply templated-directed synthesis to fabricate regular-sized graphene quantum dots. The dynamics of carbon cluster diffusion and aggregation to form nanographene islands is recorded by dynamic Scanning Tunneling Microscopy. The charge transfer interactions between graphene and fullerene, as well as the Van der Waals epitaxy of Graphene on self-assembled C60 will be discussed.

Graphene form functional hybrids with organic molecules, quantum dots and polymers and these can exhibit non-linear optical limiting properties, saturable absorption properties, outstanding photovoltaic and biosensing properties. Some examples of these applications studied in our laboratory will be given in this talk.

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