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CVD Graphene: Scalable Growth and Beyond

High quality graphene material itself is the footstone of future graphene industry. Hence scalable synthesis of graphene is extremely important, which will determine how far we can go with this wonderful two-dimensional (2-D) material. In fact, in spite of the great efforts on controlled synthesis since its first isolation in 2004, a huge gap still exists between the ideality and the reality. The ideal graphene material is composed of single crystalline hexagonal honeycomb lattice of sp^2 hybridized carbon atoms while the experimentally available graphene is a polycrystalline film with lots of structural defects and unexpected noncarbon impurities.

Over last ten years, we have made great efforts on the controlled CVD growth of graphene film from lab-scale fundamental studies to scalable instruments. The typical contributions include: roll to roll scalable growth technique and instrument, 4 inch single crystal graphene wafer and instrument, the fast growth technique, the doping growth with high carrier mobility, the CVD growth of superclean graphene, and etc. We have also succeeded in growing high quality graphene films on traditional glasses. The graphene endowed glass with extremely high thermal and electrical conductivities, leading to a new type of super graphene glasses. In a similar way, the graphene film has been deposited onto optical fibers under a high-temperature growth process, creating a graphene-decorated optical fiber. Various promising applications are demonstrated with these super graphene glass and graphene-covered optical fibers. The talk will give a brief overview of our last ten years studies on graphene synthesis and unique applications.