

Towards large-area monocrystalline graphene

:Synthesis and applications

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Grain boundaries in graphene are formed via the stitching of islands during the initial growth stage, and these boundaries govern transport properties and related device performance. Graphene can be ideally grown from a single nucleation seed, but its growth to large-area graphene can be terminated by several unknown self-limiting growth factors. Another approach is to start with numerous nucleation seeds and allow them to grow and coalesce together to produce large-area graphene. However, graphene grain boundaries (GGBs) are inevitably formed via stitching of graphene flakes, consequently limiting the graphene quality. We will describe several growth factors to achieve monocrystalline graphene growth during CVD. In addition, we will also describe how the grain boundaries can be modified by functional groups and influence transport properties at the grain boundaries. In addition, applications to electronics and energy storage done recently in our laboratory will be discussed further.