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Controlled Growth of Large-Area Mono-, Bi-, and Few-Layer Graphene by Chemical Vapor Deposition on Polycrystalline Copper Surfaces

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The effect of graphene growth parameters on the number of graphene layers were systematically studied and growth mechanism on copper substrate was proposed. Parameters that could affect the thickness of graphene growth include the pressure in the system, gas flow rate, growth pressure, growth temperature, and cooling rate. We hypothesis that the partial pressure of both the carbon sources and hydrogen gas in the growth process, which is set by the total pressure and the mole fraction of the feedstock, could be the factor that controls the thickness of the graphene. A synthetic method to produce such large area graphene films with precise thickness from mono- to few-layer would be ideal for chemists and physicists to explore the promising electronic applications of these materials. Here, large-area uniform mono-, bi-, and few-layer graphene films were successfully synthesized on copper surface in selective growth windows, with a finely tuned total pressure and CH_4/H_2gas ratio. Our findings may facilitate both the large-area synthesis of well-controlled graphene features and wide range of applications of graphene.

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