REAL-TIME TAILORING OF CVD GRAPHENE GROWTH ON LIQUID COPPER

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ABSTRACT

Graphene is a perfect two-dimensional crystal of covalently bonded carbon atoms and constitutes a building block for all graphitic structures. The superior properties of graphene make it an attractive material for a variety of technological applications. The synthesis of large-area, defect-free graphene is an important challenge toward commercialization of graphene. Chemical Vapor Deposition (CVD) is a well-established method of graphene growth. The CVD process is composed of multiple steps, including hydrocarbon decomposition, carbon adsorption and diffusion on the catalytic substrate, followed by nucleation and then growth of graphene crystals. Chemical vapor deposition on liquid metal catalysts (LMCat) is a novel process for facile synthesis of high-quality, single-crystal graphene. Liquid Metal Catalysts hold several advantages over commonly used solid catalytic substrates, including an enhanced adatom diffusivity, surface homogeneity and fluidity.

To obtain a deeper understanding of CVD growth on LMCat, development of *in situ* monitoring techniques is vital. Additionally, due to the sensitivity of the CVD process on external parameters such as temperature, gas feedstock composition and reactor geometry, industrial-scale production of LMCat graphene will inevitably require real-time control of the growth parameters, with feedback from *in situ* metrology. Herein, we demonstrate the use of *in situ* radiation optical microscopy and Raman spectroscopy towards real-time tailoring of graphene growth on liquid copper, using a purpose-built CVD reactor.

KEYWORDS: CVD graphene, Liquid metal catalyst, Raman spectroscopy, Radiation optical microscopy

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