

Probing the Gas-Phase Dynamics of Graphene Chemical Vapour Deposition using in-situ UV Absorption Spectroscopy

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The processes governing multilayer nucleation in the chemical vapour deposition (CVD) of graphene are important for obtaining high-quality monolayer sheets, but remain poorly understood. Here we show that higher-order carbon species in the gas-phase play a major role in multilayer nucleation, through the use of in-situ ultraviolet (UV) absorption spectroscopy. These species are the volatilized products of reactions between hydrogen and carbon contaminants that have backstreamed into the reaction chamber from downstream system components. Consequently, we observe a dramatic suppression of multilayer nucleation when backstreaming is suppressed. These results point to an important and previously undescribed mechanism for multilayer nucleation, wherein higher-order gas-phase carbon species play an integral role. Our work highlights the importance of gas-phase dynamics in understanding the overall mechanism of graphene growth.

Figures

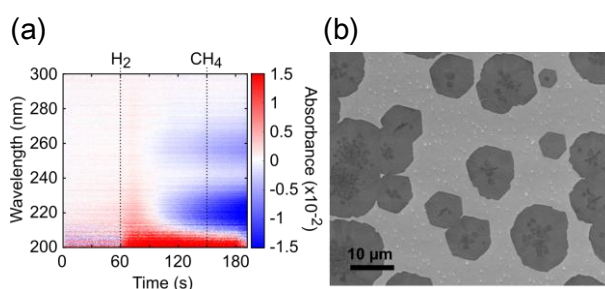


Figure 1: (a) Time evolution of the UV absorbance spectra during the growth step of the graphene synthesis process, with the dotted lines denoting when H₂ and CH₄ gases were added into the reaction chamber. (b) Corresponding SEM image of the copper surface post-process, where the nucleation of multilayered graphene islands is observed.