Supporting Information

# The Hexagon Flower Quantum Dot-Like Cu Pattern Formation During Low-Pressure Chemical Vapor Deposited Graphene Growth on Liquid Cu/W Substrate

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## Characterizations

The characterizations used in this study include scanning electron microscope (SEM) (FEI Verios 460, 1 kV) was used to observe the morphology of graphene and Cu patterns on liquid Cu/W. The optical microscopy (OM) (AXIO, Carl Zeiss) was used to observe the morphology of graphene and Cu patterns on liquid Cu/W. The atomic force microscope (AFM) (Bruker Dimension Icon) (mode (tapping), cantilever tip (thickness: 4 μm, length: 125 μm, width: 40 μm, frequency: 320 kHz), spring constant (42 N/m)) was used to measure the surface roughness of liquid Cu after 1090 °C and resolidified which is located on W. The Raman spectroscopy (514 nm, Ar+ ion laser, Renishaw, RM-1000 Invia) with the excitation energy of 2.41 eV was used for the characterization of Cu patterns and graphene on liquid Cu/W.

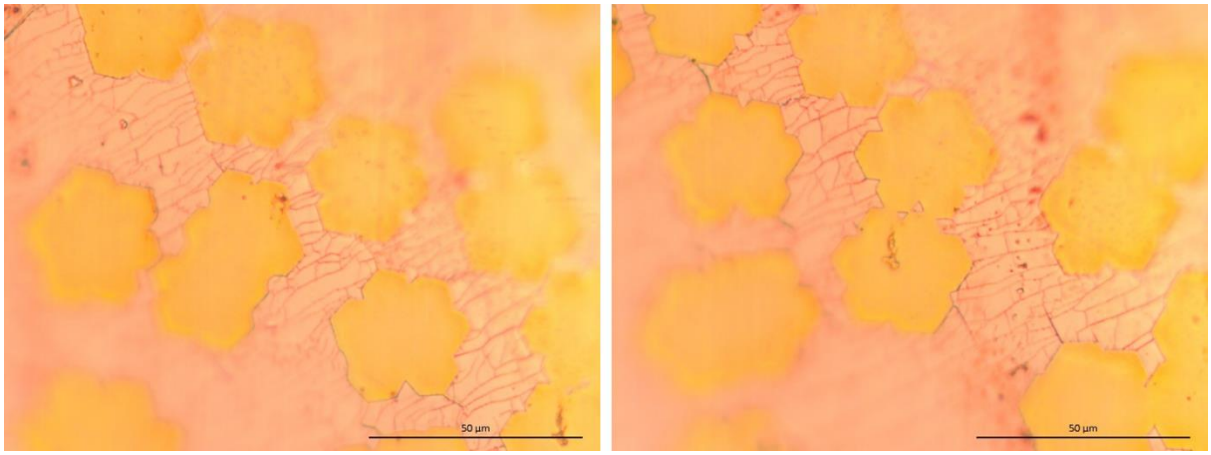


**Figure S1.** The OM images of hexagon flower-etched patterns on large-scale graphene located on liquid Cu/W foil.

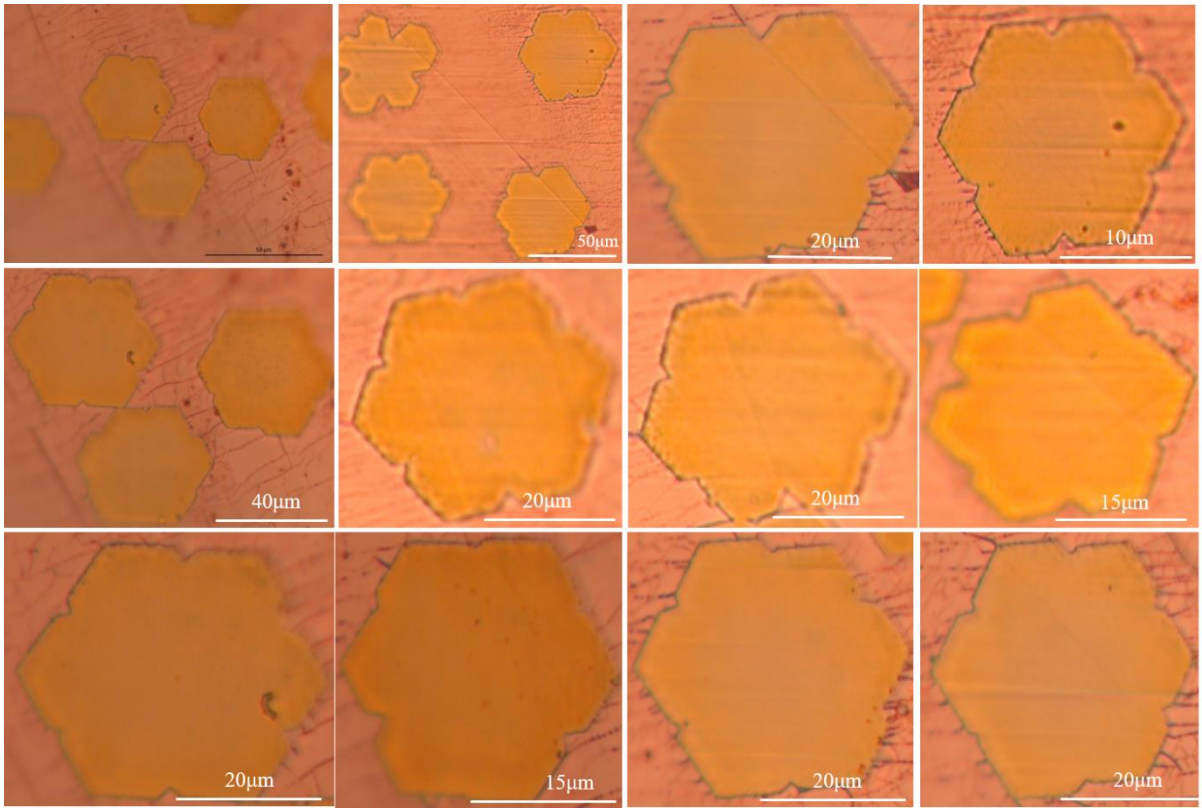


**Figure S2.** The OM images of hexagon flower-etched patterns on large-scale graphene located on liquid Cu/W foil at different magnifications.

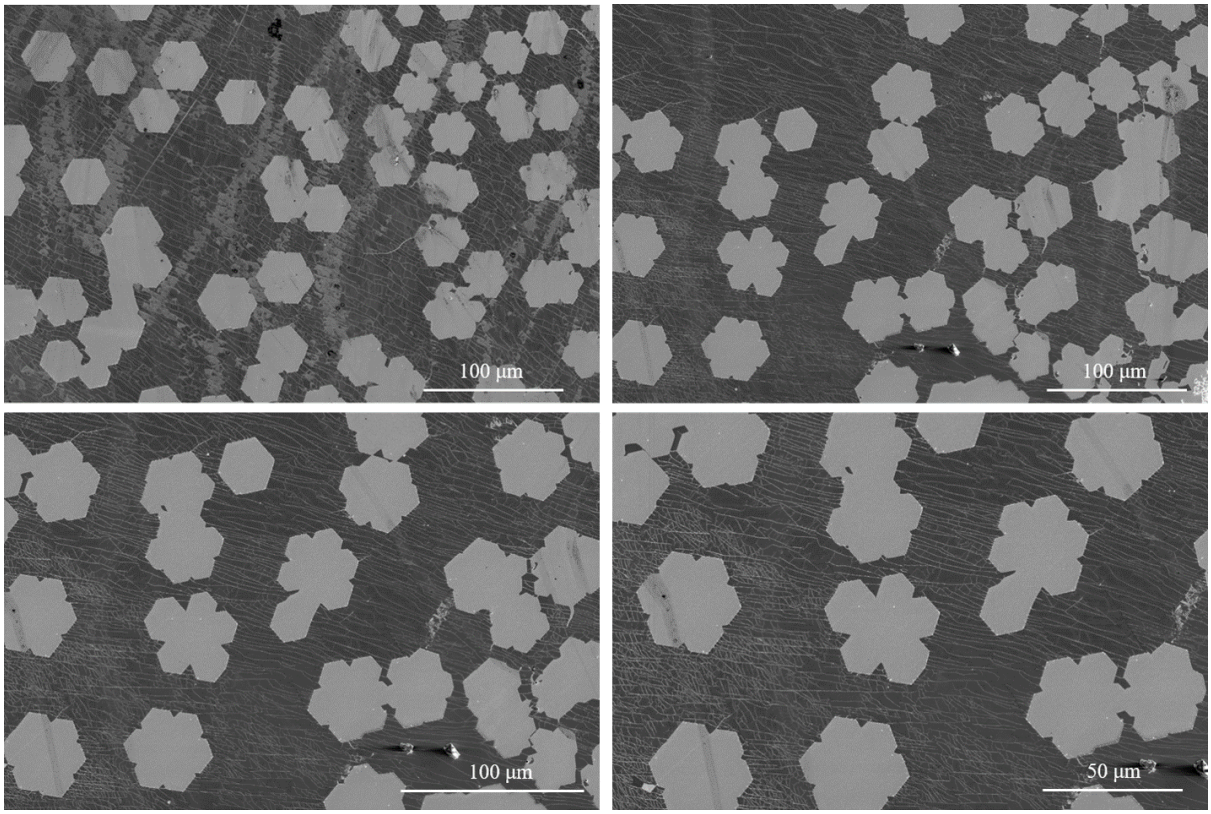


**Figure S3.** The SEM images of hexagon flower-etched patterns on large-scale graphene located on liquid Cu/W foil at different magnifications.

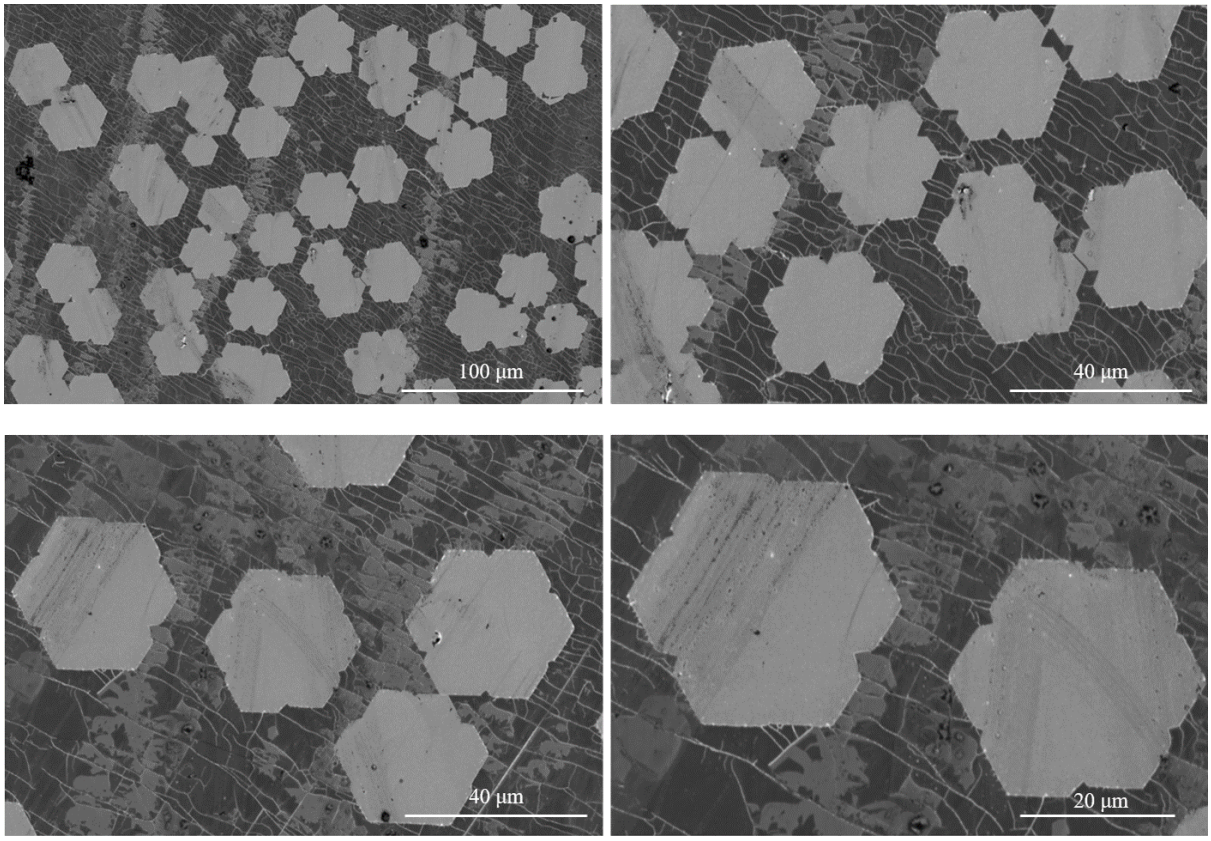


**Figure S4.** The SEM images of hexagon flower-etched patterns on large-scale graphene located on liquid Cu/W foil at different magnifications.

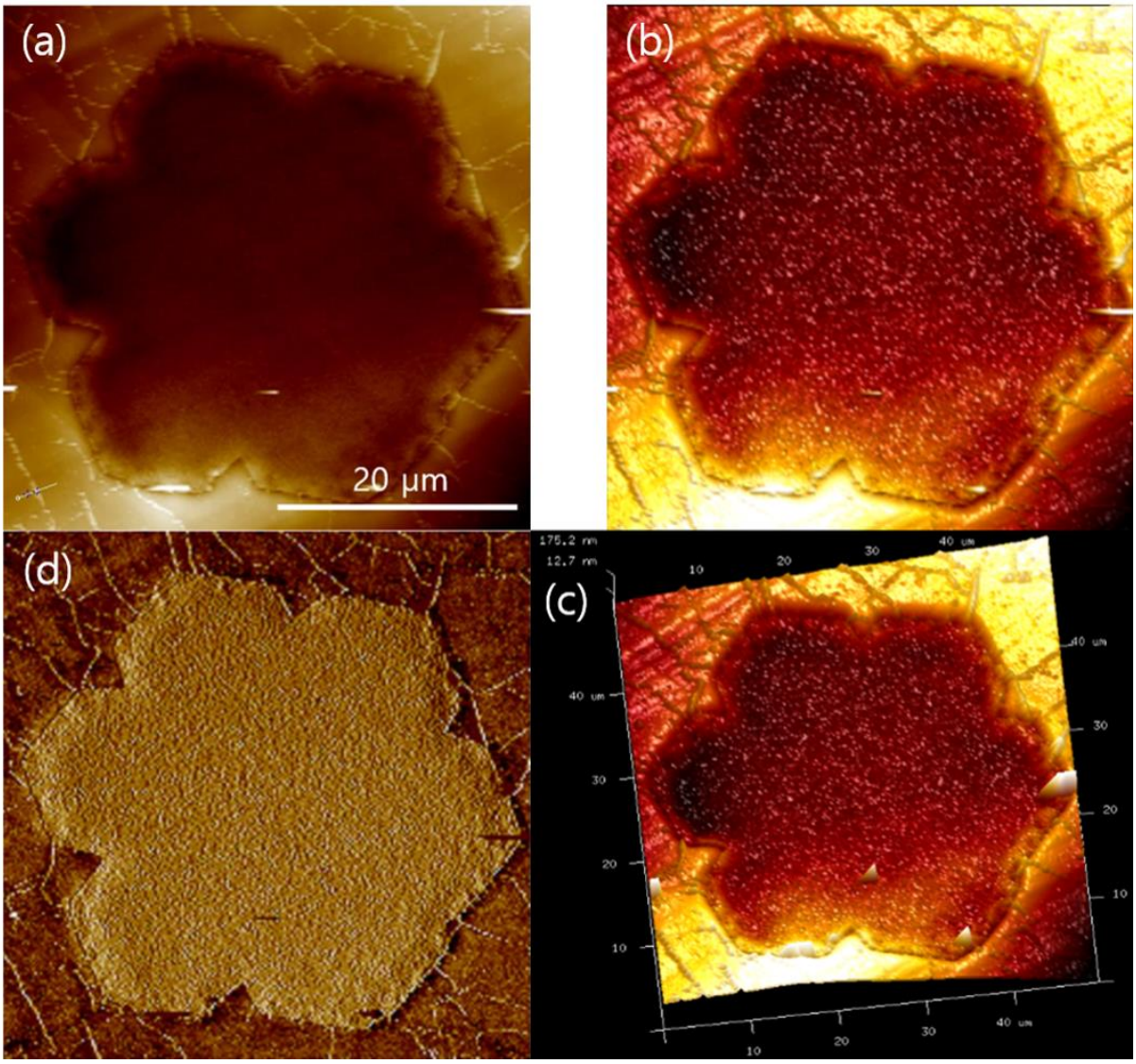


**Figure S5.** The AFM images of hexagon flower-etched patterns on large-scale graphene located on liquid Cu/W foil (a), (b) the 3D AFM mapping image of (a), the 3D AFM mapping image at different view of (a), and (d) the phase image of (a).