Epitaxial Growth of Single- and Few-layer Graphene on Pt(111) and Pd(111) Surfaces by Surface Segregation

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Graphene, the typical sp^2–bonded two dimensional materials with honeycomb crystal structure, are attractive in fundamental research because of their remarkable properties. High quality graphene over large-scale can provide new opportunities in potential applications. Therefore, synthesis of high-quality graphene is highly desirable. It is known that 3-D growth of graphitic carbon can occur on the metal surfaces at elevated temperatures through surface segregation and precipitation. Here we report the fabrication of single-layer graphene on carbon-doped single-crystal Pt(111) (0.05 %) and Pd(111) (0.5 %) substrate. It is found that uniform single-layer graphene islands about 50μm formed on Pt(111) surfaces. Continuous, wafer-scale, single-layer graphene can be achieved on Pd(111) surfaces by adjusting the experimental parameters. The atomic structure of graphene islands has been investigated by scanning tunneling microscopy (STM), which exhibit hexagonal atomic lattice and morié pattern for Pt(111) and Pd(111) substrates, respectively. The present synthesis can provide a novel technique for large-scale graphene fabrication used for fundamental research and potential applications.

References

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Figures

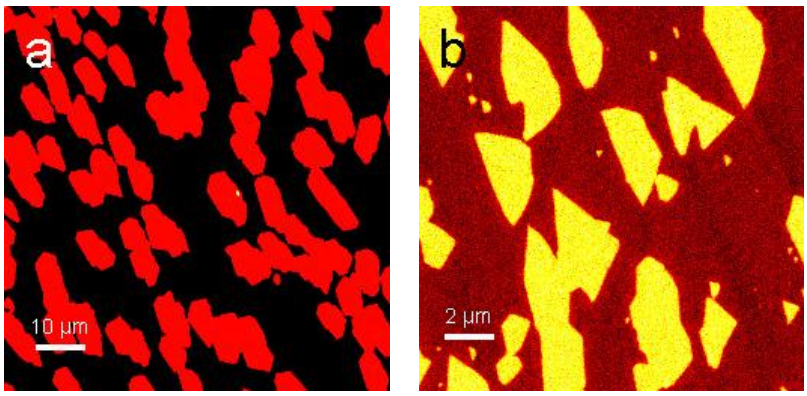

Fig.1 AES map images of single-layer graphene by surface segregation. C_{KLL} image of single-layer graphene islands on Pt(111) (a) and Pd(111) (b) substrate.