Epitaxial Growth of Single-domain Hexagonal Boron Nitride

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Abstract
The rising interest of the scientific community in graphene (GR), motivated by its fascinating properties and wide range of potential applications, has triggered substantial interest also on other two-dimensional (2D) atomic crystals and, in particular, on hexagonal boron nitride (h-BN) [1], which provides a superior insulating platform for high-performance GR devices [2]. However, a number of challenges still awaits the scientific community before the full potential of 2D atomic crystals can be exploited, such as the development of reliable methods for the growth of high-quality GR and h-BN single layers. For instance, it is still challenging to obtain large h-BN single crystalline domains because of the formation of rotated phases that give rise to grain boundaries and other 1D defects [3,4]. A deeper understanding of the h-BN growth mechanism is therefore highly desirable in order to find the optimum approach to grow high-quality films. Here, we investigate the structure of h-BN grown on Ir(111) by chemical vapor deposition (CVD) of borazine [5]. Using synchrotron radiation photoelectron spectroscopy, photoelectron diffraction and low energy electron diffraction we show that high-temperature borazine deposition gives rise to a h-BN monolayer formed by domains with opposite orientation, while a h-BN monolayer with single orientation can be synthesized by dosing borazine at room temperature and subsequently annealing the sample [6]. Our results provide new insight into the strategies for producing h -BN monolayers with single orientation.

References

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