A study on the growth of graphene on h-BN by chemical vapor deposition

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Hexagonal boron nitride (h-BN) is a two-dimensional (2D) insulator that has recently been proposed as the ideal substrate for the development of next generation graphene electronics. Its reticular match with graphene and low interlayer electronic coupling have already been shown to positively impact graphene mobility [1]. In order to move towards a more scalable approach, several groups have attempted to grow graphene directly on h-BN via chemical vapor deposition (CVD) [2-3]. However, h-BN is a poor catalyst for graphene growth and the mechanisms beyond the growth process as well as the structural properties of the grown graphene should be thoroughly investigated. In this work we select single crystal h-BN flakes as the perfect playground - rather than the often defective and nano crystalline CVD grown h-BN - for graphene growth investigations. We adopt a short and catalyst free process to grow graphene directly on exfoliated h-BN flakes via chemical vapor deposition (CVD). We observe that graphene tends to nucleate in circular shaped pads and we show that - by varying the growth parameters - the size of such pads can be increased to about 1 micron. This value is about 1 order of magnitude higher than that previously reported by other groups [2-3]. By prolonging growth time the pads merge to form a continuous graphene film. The structural and morphological properties of graphene are investigated by scanning electron microscopy (SEM), Raman spectroscopy, and atomic force microscopy (AFM). In this study particular attention is posed on the chemical and structural properties of the interface between graphene and h-BN.

Keywords: Graphene; hexagonal Boron Nitride(h-BN); Chemical vapor deposition method; SEM, Raman spectroscopy and AFM.

References

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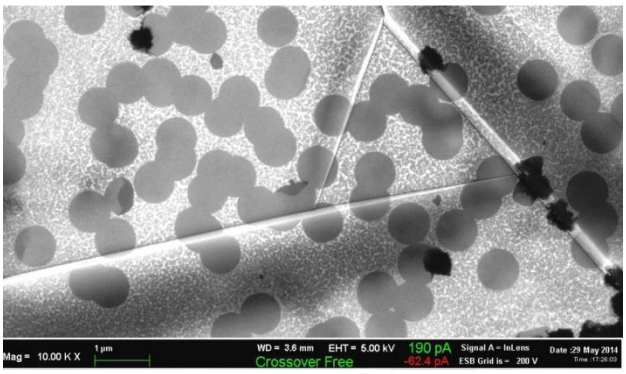

Figure 1. SEM micrograph of graphene pads grown on exfoliated h-BN by chemical vapor deposition method. The origin of the mosaic contrast on h-BN will be discussed in this work.