Few-layer hexagonal boron nitride production for high technology

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Two-dimensional (2D) materials are a topic of high interest in the materials science community for the engineering of novel devices. 2D hexagonal boron nitride (hBN), an insulator with lattice structure similar to graphene, is seen as an optimal candidate for several electronic applications, in particular in photonics and optoelectronics [1]. Interestingly, highly stable and bright single photon emission (SPE) at room temperature was observed in thin hBN samples, most likely due to the excitation of defects in the crystalline lattice [2]. Despite a considerable effort, a method that would guarantee a large-scale, high-quality and low-cost production of this material is still needed. Among the several methods available, chemical vapor deposition (CVD) appears as one of the most controllable, systematic and reliable. CVD affords the possibility of fine tuning the process parameters to achieve high-quality hBN, in compliance with the prospective demand of industrial technology. In this work, we report the growth of large-area, uniform and pristine few-layer hBN by using atmospheric-pressure CVD (AP-CVD). Although the use of low pressure is usually associated to hBN samples with higher quality and improved uniformity [3], we were able to achieve a comparable sample quality by a simpler approach. hBN films were grown on Cu foils and then transferred to different substrates for extensive characterization by a wide range of techniques. A simple and up-scalable production method for hBN might soon unlock the potential of this material for the fabrication of SPE devices for quantum information processing [4].

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FIGURES

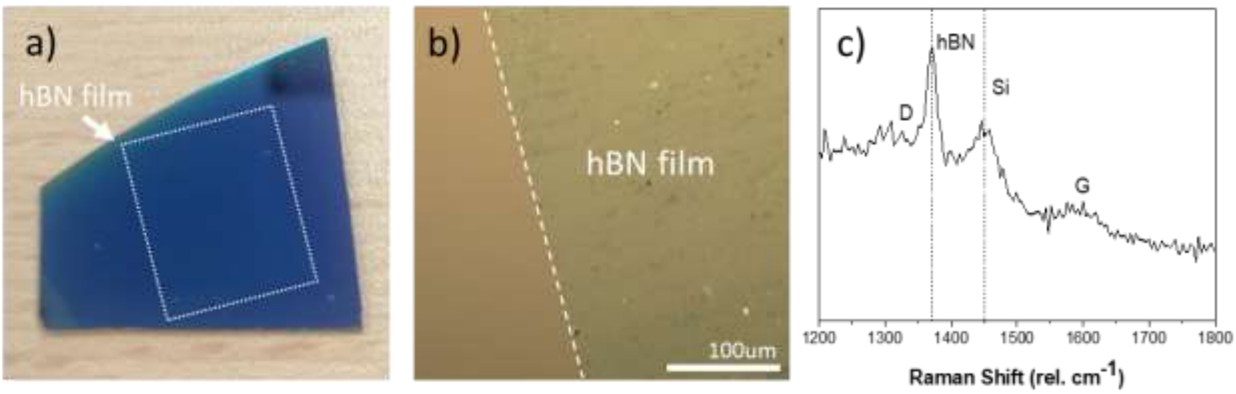

Figure 1: a) Photograph of the transferred hBN film on a Si/SiO_2 substrate. b) Optical microscopy image of the hBN film edge on a Si/SiO_2 substrate. c) Raman spectrum of the hBN film.