A KINETIC AND MORPHOLOGICAL STUDY OF DIAMOND INTERLAYER GROWTH

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A critical issue in diamond chemical vapor deposition is the inability of investigators to deposit heteroepitaxial films on carbide-forming substrates. One of the most common substrate materials, silicon, readily forms a thin, polycrystalline SiC layer when exposed to diamond growth conditions. It is not until the surface becomes saturated with carbon that diamond begins the nucleation and growth processes. Many attempts have been made to grow heteroepitaxial diamond films on silicon, but successful results are few and difficult to reproduce. Often, cross-section STM shows widely dispersed nanocrystals of heteroepitaxial diamond on silicon surrounded by a polycrystalline SiC film, on top of which grows a continuous, polycrystalline diamond film. In this work it is shown that it may be possible to exploit the ubiquitous SiC layer to grow, not single crystal diamond, but rather textured, highly oriented polycrystalline diamond. This would be carried out by careful control of the SiC interlayer growth step so that a desired SiC morphology is obtained.