

135g Growth of Sic on the Si (001) 1x1 Surface Using Monomethyl- and Dimethyl-Silanes

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This paper will present the results of thin film growth studies of 3C-SiC on hydrogen terminated Si (001) 1x1 substrates using gas source molecular beam epitaxy and the organo-silicon precursors, monomethyl silane and dimethyl silane. The substrate temperature used in these studies was 800°C. In-situ characterization of the films by Auger electron spectroscopy and reflection high-energy electron diffraction along with ex-situ scanning electron microscopy and atomic force microscopy were used to gain insight concerning the details of the growth mechanism. Along with the growth species, the experimental variables included molecular flux, and growth time. Clear evidence for the out-diffusion, segregation, and participation of substrate silicon in the growth process is given. Here, the nanostructure of the initial SiC layers plays a critical role. It is also shown that under certain conditions this undesirable process can be shutdown and that smooth, crystalline films of 3C-SiC produced. Overall growth rates for the different molecular growth species will also be discussed.