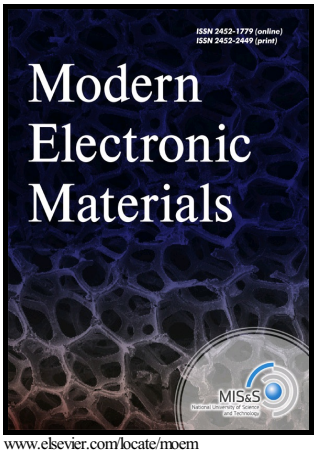


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# Research of Morphology and Structure of 3C-SiC Thin Films on Silicon by Electron Microscopy and *X*-Ray Diffractometry

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**Abstract**

Thin films of silicon carbide possessing unique properties attract increasing attention of researchers both in the field of semiconductor physics and in the technology of new semiconductor devices for high power, RF and optoelectronics. The growth of the production of silicon carbide based devices promotes the search for more resource saving and safe SiC layer synthesis technologies. Potential method is pulse laser ablation (PLA) in vacuum. This technology does not require the use of chemically aggressive and explosive gases and allows forming thin and continuous coatings with thicknesses of from several nanometers at relatively low substrate temperatures. Submicron thickness silicon carbide films have been grown on single crystal silicon by vacuum laser ablation of a ceramic target. The physical and technological parameters of silicon carbide thin film low temperature synthesis by PLA have been studied and, in particular, the effect of temperature and substrate crystalline orientation on the composition, structural properties and morphology of the surface of the experimental specimens has been analyzed. At above 500 ℃ the crystalline β-SiC phase forms on Si (100) and (111). At a substrate temperature of 950 ℃ the formation of textured heteroepitaxial 3C-SiC films was observed.

***Keywords***

Thin film, silicon carbide, pulsed laser deposition, epitaxial films, surface morphology.

## Introduction

Thin films of silicon carbide possessing unique properties attract increasing attention of researchers both in the field of semiconductor physics and in the technology of new semiconductor devices for high power, RF and optoelectronics. This is evidenced by the large number of works dealing with the growth of SiC based thin film structures that provide for a wide range of design solutions and technical parameters. The conventional synthesis method of thin silicon carbide films is chemical vapor deposition from gaseous phase (CVD) [1] of mixtures of silane, hydrocarbons and various silicon/organic compounds in a hydrogen flow. This technology allows growing high quality epitaxial layers of silicon carbide, but the main disadvantage of CVD is the requirement of high process temperatures (1400℃ and higher). The growth of the production of silicon carbide based devices promotes the search for more resource saving and safe SiC layer synthesis technologies [2, 3]. Potential method is pulse laser ablation (PLA) in vacuum. This technology does not require the use of chemically aggressive and explosive gases and allows forming thin and continuous coatings with thicknesses of from several nanometers at relatively low substrate temperatures. PLA grown SiC