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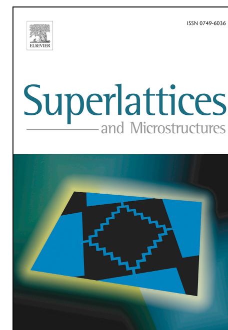

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S.A. Kukushkin, K. Kh. Nussupov, A.V. Osipov, N.B. Beisenkhanov, D.I. Bakranova

PII: S0749-6036(17)31020-0

DOI: 10.1016/j.spmi.2017.07.050

Reference: YSPMI 5160

To appear in: *Superlattices and Microstructures*

Received Date: 25 April 2017

Revised Date: 21 July 2017

Accepted Date: 21 July 2017

Please cite this article as: S.A. Kukushkin, K.K. Nussupov, A.V. Osipov, N.B. Beisenkhanov, D.I. Bakranova, Structural properties and parameters of epitaxial silicon carbide films, grown by atomic substitution on the high-resistance (111) oriented silicon, *Superlattices and Microstructures* (2017), doi: 10.1016/j.spmi.2017.07.050.

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STRUCTURAL PROPERTIES AND PARAMETERS OF EPITAXIAL SILICON CARBIDE FILMS, GROWN BY ATOMIC SUBSTITUTION ON THE HIGH-RESISTANCE (111) ORIENTED SILICON

S.A. Kukushkin [a,b,c,*], K.Kh. Nussupov [d,e], A.V. Osipov [a,c], N.B. Beisenkhanov [d,], D.I. Bakranova [d,e]**

[a]Institute for Problems of Mechanical Engineering RAS, St. Petersburg, Russia

[b]Peter the Great St. Petersburg Polytechnic University, 195251, St. Petersburg, Russia

[c]St. Petersburg National Research University of Information Technologies, Mechanics and Optics, 197101, St. Petersburg, Russia

[d]Kazakh-British Technical University, 050000, Almaty, Kazakhstan

[e]Institute of Physics and Technology, 050032, Almaty, Kazakhstan

* sergey.a.kukushkin@gmail.com, **beisen@mail.ru

Abstract. The structure, composition and physical parameters of multilayer silicon carbide system synthesized by atom substitution method on the surface of low-dislocation single-crystal (111) oriented silicon were studied by Raman spectroscopy, ellipsometry, X-ray reflectometry, electron diffraction, IR spectroscopy, X-ray diffraction, AFM and profilometry. It was revealed that SiC films consist of layers, differing in Si_yC composition, structure and thickness. The upper layers is a single-crystal 3C-SiC and the lower layers lying in depth of the substrate contain silicon carbide nanocrystals with a high degree of structure perfection and average size of 3-7 nm capable of preferential orientation (311), as well as large crystals (60-260 μm). The presence of cubic (3C-SiC) and hexagonal (mainly, 2H-SiC) polytypes with largest content of crystalline SiC phases in films with the composition closest to stoichiometric was established. In all samples there is carbon in super stoichiometric state, and its structure depends on the synthesis conditions.

Keywords: Silicon carbide; Thin films; Nanostructures; Atoms substitution method; Dilatation dipole; X-ray reflectometry.

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