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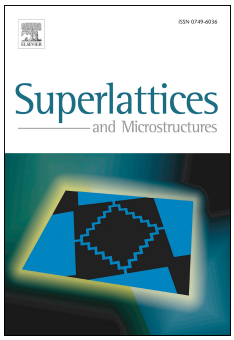

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Electron transport in nanocrystalline SiC films obtained by direct ion deposition

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ABSTRACT

Electrical conductivity of nanocrystalline SiC films obtained by direct ion deposition was investigated within the temperature interval from 2 to 770 K. It were investigated the samples of films with 3C-SiC polytype structure and the heteropolytype films formed by layers of different polytypes SiC (3C-SiC/21R-SiC, 21R-SiC/27R-SiC, 3C-SiC/15R-SiC). The films had n-type conductivity that ensured a small excess of silicon ions. The thermally activated character of electron transport in the 3C-SiC polytype films was established. In the heteropolytype films the temperature dependence of the electrical resistance was described by the relation $R(T) = R_0 \times \exp[-kT/E_0]$. It was shown that the charge transport mechanism in the heteropolytype samples is electron tunneling through potential barriers formed by the conduction band offset in the contact region of the heterojunction. Tunnel charge transport occurs due to the presence of discrete energy states in the forbidden band caused the dimensional quantization.

KEYWORDS: nanocrystalline silicon carbide, thin films, electron transport, tunneling, dimensional quantization

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