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Electrical Characterization of Individual Boron Nitride Nanowall Structures

Vasile Postica, F. Schütt, C. Lupan, H. Krüger, R. Adelung, O. Lupan

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Abstract

In this work, the individual hexagonal boron nitride (h-BN) microtubular structures with different diameter (ranging from ≈0.2 to ≈2.5 μm) and a wall thickness below 25 nm were investigated for the first time by integration on SiO2/Si substrate using a method based on focused ion beam deposition (FIB/SEM). The current-voltage (I-V) measurements were carried out in from a bias of −40 V to +40 V and in a temperature range from 25 to 100 °C. All fabricated devices showed excellent insulating properties and the resistance of ≈111 GΩ was calculated, which was attributed mainly to the top SiO2 layer of the substrate measured without h-BN. The obtained results elucidate the excellent potential of the boron nitride microtubular structures with nanowalls to be used as high-quality shielding materials of other nano- and microstructures for application in nanoelectronics, nanophotonics and power electronics, where a relatively wide range of operating temperature is necessary.

Keywords: Hexagonal boron nitride, Microdevices, Microtubes, Nanomaterials, Electrical properties, Insulator

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