Stacking Faults Induced High Dielectric Permittivity of SiC Wires: Preparation, Mechanism and Properties

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Abstract

Silicon carbide (SiC) is considered to be one of the promising EM absorbing materials due to its good oxidation resistance, low density and chemical inertness, and can be used in high-temperature and harsh environments. In this paper, C-SiC wires with different stacking faults densities were prepared by microwave heating following with post heat-treatment under different conditions. Dielectric measurements indicate that their permittivities increase with the increase in stacking faults density in 2-18 GHz. TEM observation suggests that the stacking faults were formed by embedding 2H-SiC segments in 3C-SiC matrix, which resulting in the type-II 2H/3C-SiC heterostructures. Since both the VBM and CBM of 3C-SiC are lower than those of 2H-SiC, respectively, a large conduction-band offset would occur. This may cause plenty of interface dipoles and following with large dipole polarization loss, which might be the origin of high dielectric permittivity of SiC wires.

Keywords: Stacking Fault, Dielectric Permittivity, SiC wire