

Scanning Kelvin Probe Microscopy를 이용한 SiC 소자의 분석

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Scanning Kelvin Probe Microscopy analysis of silicon carbide device structures

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Abstract : Silicon carbide (SiC) is an attractive material for high-power, high-temperature, and high-frequency applications. So far, atomic force microscopy (AFM) has been extensively used to study the surface charges, dielectric constants and electrical potential distribution as well as topography in silicon-based device structures, whereas it has rarely been applied to SiC-based structures. In this work, the surface potential and topography distributions SiC with different doping levels were measured at a nanometer-scale resolution using a scanning kelvin probe force microscopy (SKPM) with a non-contact mode AFM. The measured results were calibrated using a Pt-coated tip and a metal defined electrical contacts of Au onto SiC. It is assumed that the atomically resolved surface potential difference does not originate from the intrinsic work function of the materials but reflects the local electron density on the surface. It was found that the work function of the Au deposited on SiC surface was higher than that of original SiC surface. The dependence of the surface potential on the doping levels in SiC, as well as the variation of surface potential with respect to the schottky barrier height has been investigated. The results confirm the concept of the work function and the barrier heights of metal / SiC structures.

Key Words : SiC, SKPM, surface characteristics

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