



2019 SiC 반도체 컨퍼런스

O-07

Effect of Al Ion Implantation on Surface Properties of 4H-SiC Epitaxial Layers

김홍기, 김성준, 성민제, 강민재, 이남석, 신훈규^a

Hong-Ki Kim, Seongjun Kim, Min-Je Sung, Min-Jae Kang, Nam-Suk Lee, Hoon-Kyu Shin^a

포항공과대학교

Abstract:

Unlike Si semiconductor industry, diffusion process cannot be performed in SiC semiconductor applications due to the inherently low diffusion rates in SiC materials. A strong covalent bonding between Si and C atoms requires extremely high diffusion and activation energy, so that ion implantation process with high energy ions has been developed in SiC device fabrication together with high temperature activation processes. However, high energy or high dose implantations have been a problem for SiC epitaxial layers causing a high concentration of implantation induced defects, lattice disorder, and amorphization even after annealing above 1700°C. This leads to harmful effects on device performance. Among the degradation of the device, an interface problem is one of the important issues. This is because, interface properties for the formation of metal/SiC electrical contacts and between the gate oxide and SiC are considerably influenced by the surface conditions of SiC epitaxial layer. Inadequate ohmic contacts result in low-current driving, slow switching speed, and increased power dissipation. In addition, poor insulating properties of gate oxide lead to decreased reliability of SiC power devices.

In this study, the surface properties of 4H-SiC epitaxial layers were characterized after Al ion implantation with different acceleration energies. In addition, the surface properties were compared with the samples after activation annealing process.

Keywords

4H-SiC, Ion implantation, activation annealing, surface property

a. 교신저자 이메일

shinhk@postech.ac.kr
