이온주입 공정을 이용한 4H-SiC p-n diode에 관한 시뮬레이션 연구

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Simulation study of ion-implanted 4H-SiC p-n diodes

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Abstract : Silicon carbide (SiC) has attracted significant attention for high frequency, high temperature and high power devices due to its superior properties such as the large band gap, high breakdown electric field, high saturation velocity and high thermal conductivity. We performed Al ion implantation processes on n-type 4H-SiC substrate using a SILVACO ATHENA numerical simulator. The ion implantation model used a Monte-Carlo method. We studied the effect of channeling by Al implantation simulation in both 0 off-axis and 8 off-axis n-type 4H-SiC substrate. We have investigated the Al distribution in 4H-SiC through the variation of the implantation energies and the corresponding ratio of the doses. The implantation energies controlled 40, 60, 80, 100 and 120 keV and the implantation doses varied from 2×10^{14} to 1×10^{15} cm^{-2}. In the simulation results, the Al ion distribution was deeper as increasing implantation energy and the doping level increased as increasing implantation doses. After the post-implantation annealing, the electrical properties of Al-implanted p-n junction diode were investigated by SILVACO ATLAS numerical simulator.

Key Words : 4H-SiC, Ion implantation, p-n diode

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