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Electrical Characteristics of High Temperature Post-Annealed 4H-SiC Implanted by Aluminum Ions

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4H-SiC is the most promising poly-type for having outstanding capabilities. Ion implantation is the only practicable method for selective doping of SiC, because dopant diffusion needs too high temperatures. Whereas nitrogen(N) ion implantation has successfully been applied in order to produce low resistivity n-type SiC region, the development of efficient processes for p-type doping is still a challenging task. High dose Aluminum(Al) implantation seems to be the most promising procedure to fabricate low resistivity p-type regions in SiC and, therefore, many experimental studies have been performed in this field to find out the optimum conditions for the implantation. This paper is an attempt to make low-resistive p-type doping in a 4H-SiC epitaxial layer by using Al ion-implantation, following by high temperature annealing (>1500 ^{o}C). In this work n-type 4H-SiC wafers with 12-μm thick epilayer n-doped with 5×10^{15} cm^{-3} were used. Multiple Al ion implantations were carried out through thin oxide layer. The total Al dose and concentration were 4.9×10^{14} cm^{-2} and 1.0×10^{19} cm^{-3}. After implantation, post-annealing was performed by LPCVD in Ar ambient. For measuring R_S(sheet resistance) and activation rate, TLM(Transfer Line Method) and Hall patterns were formed. Post-implantation annealed wafer at 1700 ^{o}C for 5 min showed the lowest R_S and Al ion activation rate was 11.9 %. And R_S of wafer annealed for 5min showed the lowest value. This result means excess annealing of post-implantation cause the Al ion activation to bring down.

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