High Temperature Ohmic Contact to epitaxial n-type β-SiC thin films

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In recent years there has been increasing interest and research into silicon carbide (SiC) as a semiconductor for use in high-temperature, high-power, and high-radiation operating conditions under which silicon and conventional III-V semiconductor cannot adequately function. It occurs in both a single cubic polytype (β-SiC), as well as numerous α polytypes which are either hexagonal or rhombohedral in structure. The β-form is believed to be the most promising for electronic applications due to its smaller bandgap (2.2eV vs. 2.8eV for 6H-SiC) and its higher theoretical saturation electron drift velocity. However, One obstacle for the use of this new material is the lack of good ohmic contacts which are stable up to high temperatures and produce a low contact resistance. In this study, Ti-based, W-based(metal, nitride) materials was used for ohmic contact to β-SiC epitaxial thin films. Ti and W give an ohmic contact to n-type β-SiC and are refractory metal possessing high temperature melting temperature. Also, they take a formation both of carbides and silicides with silicon carbide. Ti- and W-based material were deposited by magnetron sputtering method. Contact resistivity of as-deposited and annealed Ti-,W-based material films on n-type single crystalline β-SiC(001) are characterized using an extrapolation method. The β-SiC substrates used in the experiment are deposited by CVD method using new organic precursor, BTMSM (Bis-trimethylsilylmethane). Carrier concentration of SiC substrate are about 10^{18}-10^{19} /cm^3. The chosen materials exhibit good characteristics.