[P-24]

Homoepitaxial growth of 4H-SiC by Hot-wall CVD using BTMSM

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Silicon carbide is the most promising wide band-gap semiconductor materials for high power and high frequency devices due to its superior electrical and mechanical properties and as a result, its predominance in high power devices is well established. Among the many polytypes of SiC, most recent works have focused on 4H-SiC, due to the high saturated electron drift velocity and commercial availability. Recent developments in substrate production by the sublimation technique and epitaxial growth of high quality films by chemical vapor deposition (CVD) enable the production of material suitable for high power devices.

However, despite the recent progress in SiC epitaxial and bulk growth techniques, one major drawback in SiC CVD is its relatively low growth rate. For wide applications of SiC electronic devices, a higher throughput is required in SiC epitaxial growth. A high throughput will be attained by increasing the growth rate or the capacity of loaded wafer, or both.

In this work, the authors describe the 4H-SiC epitaxial layer growth by hot-wall CVD at 1500°C in horizontal reactor. The design of hot-wall susceptor and the simulation of temperature profile is presented. And the growth rate dependency on temperature and source flow rate, and the FWHM of epilayers are shown. A very low back ground doping level of mid $10^{15}/cm^3$ was achieved without SiC coating of graphite susceptor.