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Liquid Phase Epitaxial Growth of Al-doped f-SiC for White Light-Emitting Diodes

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The present paper focuses on our recent experimental results of growing a new type of compound semiconductor crystal, i.e. fluorescent silicon carbide (f-SiC), using the liquid solution phase epitaxial (LPE) technology. This new type of f-SiC based white LEDs (WLEDs) represents higher luminous efficiency, better light quality and longer lifespan, compared to the current yellow phosphor based white LEDs.

Liquid phase epitaxy technology can yield a high crystalline quality in terms of structural perfection owing to the fact that it is a near equilibrium crystalline growth process. In addition, the technological equipment required for LPE is relatively inexpensive. The fundamental backgrounds for LPE growth of Al-doped 6H-SiC are first introduced and elaborated by new thermodynamic and crystal growth models. Based on theoretical analyses, the new designed experimental apparatus is then constructed. The experimental results are presented and discussed. Since operational temperature of LPE growth is much lower than that currently used in physical vapour transport (PVT) process, it is expected to save the energy consumption for SiC crystal growth.