Epitaxial lateral overgrowth of semiconductor structures – physics, technology and applications

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Abstract

Despite sophisticated methods of engineering buffer layers for the growth of lattice-mismatched epitaxial structures the resultant density of defects is often too high for device applications. IN response to this, the epitaxial lateral overgrowth (ELO) technique has been developed to prevent the propagation of dislocations generated at the epilayer/substrate interface to the next-grown layers of the structure. The breakthrough in development of long lifetime cw GaN/InGaN blue lasers, being primarily due to the high efficiency of defect filtration during lateral overgrowth, is the most spectacular achievement of the technique.

The talk will provide a general review of the epitaxial lateral overgrowth technology and of the application of ELO layers as substrates with adjustable lattice parameter. In particular, the issues of ELO growth mechanisms, defect filtration during the ELO procedure and strain in ELO layers will be addressed. Literature data on MOVPE ELO growth of GaN on sapphire or SiC and our results on lateral overgrowth of III-V compound semiconductors (GaAs/Si, GaSb/GaAs, etc.) by liquid phase epitaxy will be used as examples.