

Visible LED realization on polarity controlled substrate

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PhD may follow: Yes

Summary :

The exceptional structural and optical properties of III-V semiconductor nanowires (GaN, AlN, InN and their alloys) make them attractive candidates for a future generation of visible and ultraviolet light emitting diodes (LEDs). The crystallographic phase of these materials (wurtzite) is not centrosymmetric: as a result, the epitaxial layers – or the nanowires – are terminated either by a nitrogen plane or by a metal one. The nitrogen polarity being associated with point defects incorporation, the realization of efficient, nanowire-based, devices implies to use metal polarity and to control it. Considering that GaN nanowires spontaneously nucleated on Si or numerous alternative substrates exhibit nitrogen polarity, their conversion to metal polarity is essential to realize optimized LEDs. Preliminary experiments have demonstrated that such a conversion can be achieved by way of oxygen plasma treatment of nitrogen polar GaN nanowires. The goal of the internship will be to confirm these preliminary results and next realize GaN/InGaN LED structures to compare their properties to their nitrogen polar counterparts. The internship will be focused on experiment and will provide training to molecular beam epitaxy (MBE) of GaN nanowires, to plasma treatment, scanning electron microscopy (SEM) and cathodoluminescence. The application ultimately targeted deals about the realization of nanowire LEDs on large silicon substrates. Prolongation in PhD is possible.

Requested skills :

interest in experimental science