# Insights into the utilization of porous semiconductors for strain-relieved semiconductor layers

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Conventionally InGaN based blue and green emitting LEDs and AlInGaP based red emitting LEDs have been utilized to produce the primary colors RGB required for various display and lighting technologies, due to their inherent high efficiency. Although the red emitting AlInGaP structures are highly efficient, size reduction in this material is accompanied by a sharp decline in efficiency. The InGaN based materials can emit in the red spectrum however the lattice mismatch between red emitting InGaN quantum wells and the GaN buffer layers is too high that leads to poor material quality and therefore reduced quantum efficiency.

Porous semiconductors have conventionally been utilized for refractive index contrast with non-porous layers as well as sacrificial layer for film removal. However, use of this layer as a flexible film for strain relief in lattice mismatched films was a novel approach. For InGaN based red emitting LEDs this approach proved to be extremely useful to relieve the strain between the high indium content films that emit in the red regime compared to the GaN buffer layers utilized as the base to deposit these structures. For the invited talk, the author will present the step-by-step development of the porous GaN based flexible substrate technology for long wavelength emitters, along with new insights obtained on evolution of dislocations using high resolution TEM cross sectional scans.

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