Abstract Submitted
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Fundamental studies of lattice mismatched, strain-free $Ga_xIn_{1-x}P$ alloys for x > 0.51[1] L. BHUSAL, M. STEINER, B. FLUEGEL, A. MASCARENHAS, National Renewable Energy Laboratory, 1617 Cole Blvd, Golden CO 80401 — Fundamental electronic and optical properties of the $Ga_xIn_{1-x}P$ alloy system are investigated for applications requiring high bandgaps in the range of ∼1.9–2.2 eV, corresponding to the composition range 0.51<x<0.8. Samples were grown by metalorganic vapor phase epitaxy (MOVPE) on GaAs substrates. To achieve the nearly-strain-free, lattice-mismatched compositions with higher bandgaps, the samples were prepared by first growing a thick step-graded layer of $GaAs_{1-y}P_y$ to bridge the lattice misfit between the $Ga_xIn_{1-x}P$ layers and the GaAs substrate. Phenomena such as spontaneous long-range ordering and intermixing of Γ-L-X bands near the direct-indirect crossover were studied using high resolution x-ray diffraction, modulated electro/photo-reflectance, and time-resolved photoluminescence techniques at various temperatures. The results will be discussed within the context of using these high bandgap alloys as light emitting diodes (LEDs) emitting within the green gap.

[1]This abstract is subjected to government rights. This work was supported by the DOE-OS-BES under contracts No. DE-AC36-08GO28308 to NREL.

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