# Ordering phenomena and formation of nanostructures in $In_xGa_{1-x}N$ layers coherently grown on GaN(0001)

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We study the impact that local strain effects have on the spatial distribution of In in coherent $In_xGa_{1-x}N$ grown epitaxially on GaN(0001) using an effective crystal growth modeling technique that combines a semi-grand-canonical Monte Carlo simulation with an ab initio parameterized empirical force field.[Physical Review B 90, 245301(2014)] Our calculations show that $In_xGa1_{-x}N$ epitaxial layers exhibit a strong tendency towards ordering, as highlighted by the formation of a vertical stack of the $\sqrt{3}\times\sqrt{3}$ patterned layers along the direction. The ordering phenomena are identified as a key factor that determines lateral phase separation in $In_xGa_{1-x}N$ epitaxial layers at the nanometer scale. Consequences of this nanophase separation for the enhanced radiative emission through carrier localization in $In_xGa_{1-x}N$ of $x < 1/3$ are discussed.