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Artificially-Engineered III-Nitride Digital Alloy for Solar Energy Harvesting WEI SUN, CHEE-KEONG TAN, NELSON TANSU, Center for Photonics and Nanoelectronics, Department of Electrical and Computer Engineering, Lehigh University — The pursuit of III-Nitride based solar cell has been primarily driven by the attribute of broad solar spectrum coverage through the use of InGaN material. However, the phase separation in high In-content InGaN alloy has been one of the largest barrier in the pursuit of nitride-based solar cells. Thus, a new approach in extending the bandgap coverage in nitride-based alloy needs to be pursued. In this work, we propose a novel artificially engineered III-Nitride based digital alloy structure to overcome the limitation presented by the epitaxy of phase-separated InGaN material with high In-content. The InGaN digital alloy structure is a short period superlattice that is formed by GaN and InN thin film layers alternately in which the thickness of each layer is represented by a number of monolayer (ML). By adjusting the thickness of GaN layer (m MLs) and InN layer (n MLs), the In-content and the band structure of InGaN digital alloy can be engineered correspondingly. The use of this digital alloys demonstrated suitability of this method in extending the bandgap coverage in nitride-based semiconductors.

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