abstract

III-Nitride nanostructures have been an active area of research recently due to their ability to tune their optoelectronic properties. Thus far work has been done on InGaN quantum dots, nanowires, nanopillars, amongst other structures, but this research reports the creation of a new type of InGaN nanostructure, nanorings. Hexagonal InGaN nanorings were formed using Metal Organic Chemical Vapor Deposition through droplet epitaxy. The nanorings were thoroughly analyzed using x-ray diffraction, photoluminescence, electron microscopy, electron diffraction, and atomic force microscopy. Nanorings with high indium incorporation were achieved with indium content up to 50% that was then controlled using the growth time, temperature, In/Ga ratio and III/N ratio. The analysis showed that the nanoring shape is able to incorporate more indium than other nanostructures, due to the relaxing mechanism involved in the formation of the nanoring. The ideal conditions were determined to be growth of 30 second droplets with a growth time of 1 minute 30 seconds at 770 C to achieve the most well developed rings with the highest indium concentration and the least amount of phase separation.