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Morphological Studies on GaN Nanowire Growth Modes[1] ZHENG MA, XIAOHONG AN, SWASTIK KAR, MONEESH UPMANYU, EUGEN PANAITESCU, LATIKA MENON, Northeastern University — We describe our results on growth of single crystal GaN nanowires in three different growth modes (straight, serrated and epitaxial) on catalyst-patterned substrates by means of chemical vapor deposition. The growth is carried out in a tube furnace wherein gallium oxide is used as reactor source and a mixture of ammonia and hydrogen gas is used as precursor. Growth of GaN nanowires are demonstrated on both Au and Ni-catalyst patterned substrates. We show that by controlling the deposition parameters, specifically the size of the catalyst and amount of gallium oxide, we can control the growth morphology. While straight GaN nanowires typically grow on substrates patterned with catalyst particles with dimensions of the order of 100nm, the epitaxial nanowires grow on substrates with much smaller dimensions of catalyst particles 50nm. The newly demonstrated GaN wire growth mode with periodic serrations, typically grow under conditions involving large catalyst size ∼300nm and excess gallium oxide. In this work, a detailed investigation is carried out on the structural properties of the three different growth modes by means of high resolution transmission microscopy, x-ray diffraction and Raman spectroscopy studies in order to obtain a better understanding of their growth mechanism.

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