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Optical properties of gallium nitride nanowires

<u>Hee Won Seo</u>, Seung Yong Bae, Jeunghee Park, sangsig Kim* Department of materials chemistry, Korea University, Jochiwon 339-700 Department of Electrical Engineering, Korea University, Seoul 136-701*

Highly crystalline gallium nitride nanowires with uniform diameter of 25 nm were synthesized on silicon substrates by catalytic thermal reaction of gallium sources with ammonia. A careful examination into x-ray diffraction data suggests that the nanowires would experience biaxial compressive stresses in the inward radial direction and induced uniaxial tensile stresses in the growth direction. A strong PL band was observed in the energy range of 2.9~3.6 eV, which originate from the recombination of the bound excitons. The various stresses may result in the widely distributed PL energy position and the strong room-temperature PL intensity.