TW-P006

Photoluminescence Studies of ZnO Nanostructures Fabricated by Using Combination of Hydrothermal Method and Plasma-Assisted Molecular Beam Epitaxy Regrowth

Giwoong Nam[1], Byunggu Kim[2], Youngbin Park[2], Soaram Kim[1], Sang-heon Lee[3], Jong Su Kim[4], Jae-Young Leem[1,2]*

[1]Department of Nano Systems Engineering, Center for Nano Manufacturing, Inje University, Gimhae, Gyungnam 621-749, [2]Department of Nano Engineering, Inje University, Gimhae, Gyungnam 621-749, [3]School of Chemical Engineering, Yeungnam University, Gyeongsan 712-749, [4]Department of Physics, Yeungnam University, Gyeongsan 712-749, Korea

ZnO nanostructure was fabricated on a Si substrate using two-step growth. The seed layer was grown on the Si substrate by a sol-gel spin-coating. In the first step, ZnO nanorods were grown by a hydrothermal method at 140°C for 5 min. In the second step, a ZnO thin film was grown on the ZnO nanorods by spin-coating. After growth, these films were annealed at 800°C for 10 min. Electrical and optical properties of ZnO nanostructures have modified by plasma-assisted molecular beam epitaxy (PA-MBE) regrowth. The carrier concentration and resistivity increased by PA-MBE regrowth. In the photoluminescence, the full width at half maximum and intensity were decreased and increased, respectively, by PA-MBE regrowth.

Keywords: ZnO, Molecular beam epitaxy, Photoluminescence

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Synthesis and Temperature-Dependent Local Structural Properties of Ti2O3

Inhui Hwang[1], Zhenlan Jin[1], Changin Park[1], Bingzhi Jiang[2], S.-W. Han[1]*

[1]Department of Physics Education and Institute of Fusion Science, Chonbuk National University, Jeonju 561-756, Korea, [2]Department of Physics, Yanbian University, Yanji 133002, China

Ti2O3 is known as a typical Mott insulator with a transition temperature of near 200°C. Unlike VO2, Ti2O3 does not have a structural phase transition near the metal-insulator-transition (MIT) temperature. We investigated the temperature-dependent thermal vibration change using temperature-dependent x-ray absorption fine structure (XAFS) at Ti K-edge in the temperature range of 300∼600 K. Ti2O3 powder and films were synthesized using thermal chemical vapor deposition (CVD) at 800∼900°C. X-ray diffraction measurements show a single phased Ti2O3 at room temperature. XAFS confirmed no structural phase transition in the temperature of 300∼600 K. A small but distinguishable structural disorder change was observed near the transition temperature. We will discuss the MIT behavior with the change of structural disorder.

Keywords: Ti2O3, disorder, MIT, structure