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The Effect of Growth Temperature on the Epitaxial Growth of Vertically Aligned ZnO Nanowires by Chemical Vapor Deposition

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Vertically aligned single-crystal ZnO nanowires have been successfully grown on c-plane sapphire substrate using chemical vapor deposition (CVD) without catalyst. According to growth temperatures, it was changed ZnO growth characteristic. We investigated the effect of substrate temperatures on the growth ZnO films or nanowires on c-plane (0001) sapphire substrates. The ZnO films were acquired at 500°C, whereas the ZnO nanowires were obtained at 600°C, 700°C, and 800°C. The growth behavior diameter and growth rate of ZnO were changed due to different temperature. As a result of analyzing in-plane residual stress by X-ray diffraction, the optimized condition of ZnO nanowires were at 600°C.

Keywords: ZnO, Nanowires, Compressive stress, Chemical vapor deposition

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Tunable Magnetism by Magnetic Phase in Fe_3O_4/ZnO Multilayer

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Fe_3O_4 having half metallic property is one of the efficient spin filtering materials which are widely used in spintronic research field and ZnO is wide band gap semiconductor which can be used by tunnel barrier or semiconductor channel in spin MOSFET. We investigated the magnetic and the electric properties of Fe_3O_4/ZnO multilayer fabricated on c-Al_2O_3 substrate by pulsed laser deposition (PLD). For multilayer films, PLD was performed at variable temperatures such as 200～750°C and at target distance from 40 to 80 mm, KrF eximer laser of 1.5 J/cm^2 and a reputation rate of 2Hz. Fe_3O_4/ZnO multilayers were deposited at 4×10^{-6} Torr. After fabricating Fe_3O_4/ZnO multilayers, Fe_3O_4/ZnO multilayers were treated by RTA(Rapid Thermal Annealing) at various temperature to change magnetic phase. The magnetism of the multilayer is changed by thickness of the ZnO tunnel barrier. Magnetic phase of FexOy showed a very small magnetism due to Fe_2O_3 α-phase, but large magnetism from Fe_3O_4 or Fe_2O_3 γ-phase was observed. In the present study, effect of the ZnO thickness on the MR (magnetoresistance) ratio was investigated in detail.

Keywords: Fe_3O_4, ZnO, Magnetic property, Pulsed laser deposition