산화아연 나노핵의 조작을 통한 산화아연 나노로드의 제어

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Artificial Control of ZnO Nanorods via Manipulation of ZnO Nanoparticle Seeds

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Abstract : Synthesis and characterization of ZnO structure such as nanowires, nanorods, nanotube, nanowall, etc. have been studied to multifunctional application such as optical, nanoscale electronic and chemical devices because it has a room-temperature wide band gap of 3.37eV, large exiton binding energy(60meV) and various properties. Various synthesis methods including chemical vapor deposition (CVD), physical vapor deposition, electrochemical deposition, micro-emulsion, and hydrothermal approach have been reported to fabricate various kinds of ZnO nanostructures. But some of these synthesis methods are expensive and difficult of mass production. Wet chemical method has several advantage such as simple process, mass production, low temperature process, and low cost.

In the present work, ZnO nanorods are deposited on ITO/glass substrate by simple wet chemical method. The process is perfomed by two steps. One-step is deposition of ZnO seeds and two-step is growth of ZnO nanorods on substrates. In order to form ZnO seeds on substrates, mixture solution of Zn acetate and Methanol was prepared.(one-step) Seed layers were deposited for control of morpholgy of ZnO seed layers by spin coating process because ZnO seeds is deposited uniformly by centrifugal force of spin coating. The seed-deposited samples were pre-annealed for 30min at 180℃ to enhance adhesion and crystallinnity of ZnO seed layer on substrate. Vertically well-aligned ZnO nanorods were grown by the "dipping-and-holding" process of the substrates into the mixture solution consisting of the mixture solution of DI water, Zinc nitrate and hexamethylenetetramine for 4 hours at 90°C.(two-step) It was found that density and morphology of ZnO nanorods were controlled by manipulation of ZnO seeds through rpm of spin coating. The morphology, crystallinity, optical properties of the grown ZnO nanostructures were carried out by field-emission scanning electron microscopy, high-resolution electron microscopy, photoluminescence, respectively. We are convinced that this method is complementing problems of main techniques of existing reports.

Key Words : ZnO, nanorods, wet chemical, ITO