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Electrical improvement of direct-patternable ZnO thin films incorporated Pt nanoparticles

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ZnO film has been investigated during several decades because it has excellent optical property like a transmittance among the range of visible light for using transparent conducting oxide (TCO) films. But ZnO film has not enough conductivity for application of TCO devices. Therefore we synthesized Platinum nanoparticles and it incorporated with ZnO due to improve the electrical property of ZnO film by sol-gel synthesis method. Also, direct-pattenable ZnO thin film was realized without photoresist and dry etching by photochemical solution deposition. Photosensitive ortho-nitrobenzaldehyde was introduced into the solution precursors as a stabilizer and contributed to form a cross-linked network structure during photochemical reaction. Pt nanoparticles were synthesized according to methanol reduction method and their size was 2.9-nm on the average. In this study, we fabricated photosensitive ZnO thin film incorporated Pt nanoparticles by sol-gel process and spin-coating for using photochemical solution deposition. The optical and electrical properties of ZnO film with or without various atomic percent of Pt nanoparticles anneal at various temperatures were characterized by uv-visible spectroscopy and 4-point probe method, respectively. Transmittance was decreased according to the increase of atomic percent of Pt nanoparticles incorporated into ZnO film and sheet resistance was decreased in same conditions for Pt nanoparticles. We investigated the surface of ZnO thin film incorporated Pt nanoparticles about the reason of these results using x-ray diffraction, scanning electron microscopy, and x-ray photoelectron spectroscopy.