

Study of metal dopants and/or Ag nanoparticles incorporated direct-patternable ZnO film by photochemical solution deposition

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Abstract : Zinc oxide (ZnO) has drawn much interest as a potential transparent conducting oxide (TCO) for applying to solar cell and front electrode of electro-luminescent devices. For the enhancement of electrical property of TCOs, dopant introduction and hybridization with conductive nanoparticles have been investigated. In this work, ZnO films were formed on glass substrate by using photochemical solution deposition of Ag nanoparticles dispersed or various metal (Ag, Cd, In, or Sn) contained photosensitive ZnO solutions. The usage of photosensitive solution permits us to obtain a micron-sized direct patterning of ZnO film without using conventional dry etching procedure. The structural, optical, and electrical characteristics of ZnO films with the introduction of metal dopants with/without Ag nanoparticles have been investigated to check whether there is a combined effect between metal dopants and Ag nanoparticles on the characteristics of ZnO film. The phase formation and crystallinity of ZnO film were monitored with X-ray diffractometer. The optical transmittance measurement was carried out using UV-VIS-NIR spectrometer and the electrical properties such as sheet resistance and conductivity were observed by using four-point probe.

Key Words : ZnO, Ag nanoparticles, transparent conducting oxides, direct-patterning