

## **Investigation of direct-patternable hybridized ZnO thin film for applications in solar cells**

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Zinc Oxide (ZnO) has drawn much interest as a potential transparent conducting oxide (TCO) for applications in solar cells due to the advantages of non-toxicity, low cost, abundance, and stability in hydrogen plasma compared to indium tin oxide (ITO). So, ZnO will be replacing ITO as a front electrode in solar cells as well as transparent thin film devices if the desired conductivity could be achieved without the loss of transparency. Thin film deposition and etching process, which brings some problems and demerits, by lithographic process using photoresist have to be repeated for obtaining a fine micro-scale patterning. However if we use photosensitive stabilizer in thin film deposition, we do not need photoresist nor dry etching for micro-scale patterning. Due to its high electrical conductivity and chemical stability, silver and carbon nanotubes has been widely investigated. In this work, hybridized ZnO thin films with Ag nanoparticles or carbon nanotube were prepared and direct patterning of films was realized by photochemical solution deposition without photoresist and dry etching. Photosensitive ortho-nitrobenzaldehyde was used as a stabilizer and formed a cross-linked network structure under UV-exposure. X-ray diffraction was served to provide the information of crystalline structure. The optical transmittance measurement was carried out using UV-VIS-NIR spectrometer. And the electrical properties such as sheet resistance were measured by four-point probe. For surface chemical bonding state of film, X-ray photoelectron spectroscopy was used with an Al K $\alpha$  monochromatic source.