Photo-catalytic effect of ZnO nanoparticles by Spray-Pyrolysis method

Myoung-Hwa Kim, Sang-Hun Nam, Young Dok Kim and Jin-Hyo Boo

Department of Chemistry and Institute of Basic Science, Sungkyunkwan University, Suwon 440-746, Republic of Korea

Recently, ZnO nanoparticles are studied in various application fields by many researcher. Photocatalyst research is progressing many in various fields. We have synthesized ZnO nanoparticles using Zn (CH₃COO)₂ · 2H₂O source by Spray-Pyrolysis method at various synthesis temperature. In this paper, we studied on photocatalytic activity of the ZnO nanoparticles as compared with commercial TiO₂ powder (Degussa P-25).

When the ZnO nanoparticles irradiated by UV light, ZnO nanoparticles have catalyzed reduction and oxidation (redox) reactions in presence of O₂/air/water and degraded Methylene Blue (MB) solution. We made an experiment in O₂ plasma surface treatment to increasing photocatalytic activity of ZnO nanoparticles. Photocatalytic activity of ZnO nanoparticles showed effect that increase about 60% by O₂ plasma surface treatment.

The characterization of ZnO nanoparticles were analyzed by Transmission Electron Microscopy (TEM), Energy Dispersive Spectrometer (EDS) and BET test. Also we defined the photocatalytic activity of the ZnO nanoparticles using UV-VIS Spectroscopy.

Carrier transport in flexible organic bistable devices of ZnO nanoparticles embedded in an insulating poly(methyl methacrylate) polymer layer

Dong-Ick Son¹,², Dong-Hee Park¹, Won Kook Choi¹, Sung-Hwan Cho³, Won-Tae Kim³, Tae Whan Kim³

¹Korea Institute of Science and Technology, Materials Science and Technology Research Division
²Department of Information Display Engineering, Hanyang University

The bistable effects of ZnO nanoparticles embedded in an insulating poly(methyl methacrylate) (PMMA) polymer single layer by using flexible poly-vinylidene difluoride (PVDF) and polyethylene terephthalate (PET) substrates were investigated. Transmission electron microscopy (TEM) images revealed that ZnO nanoparticles were formed inside the PMMA polymer layer. Current-voltage (I-V) measurement on the Al/ZnO nanoparticles embedded in an insulating PMMA polymer layer /ITO/PVDF and Al/ZnO nanoparticles embedded in an insulating PMMA polymer layer /ITO/PET structures at 300 K showed a nonvolatile electrical bistability behavior with a flat-band voltage shift due to the existence of the ZnO nanoparticles, indicative of trapping, storing, and emission of charges in the electronic states of the ZnO nanoparticles. Carrier transport mechanism of a bistable behavior for the fabricated organic bistable device (OBD) structures is described on the basis of the I-V results. (*This work is supported by KIST Future-Resource Program.)