EFFECTS OF DOPING PRECURSORS ON THE
CHARACTERISTICS OF ZnO:Al BY SPRAY PYROLYSIS
METHOD

Name : Debby Ornella Caprizia (2307 100 008)
       Teguh Budi Santoso    (2307 100 149)
Department : Chemical Engineering FTI-ITS
Advisor : Prof. Dr. Ir. Sugeng Winardi, M.Eng
          Dr. Widiyastuti, ST, MT

Abstract
Zinc Oxide (ZnO) as a material of transparent conducting oxide’s (TCO) are widely applied in various fields of technology, such as liquid crystal displays (LCD) and solar cell. Electrical conductivity of ZnO increased with the addition of Al doping. Therefore, this research is conducted to determine effects of doping precursors on the characteristics of ZnO:Al by spray pyrolysis method.

Doping used in this research are Al$_2$(SO$_4$)$_3$, Al(NO$_3$)$_3$, and AlCl$_3$. In operating conditions at furnace’s temperature 900°C, carrier gas flow rate 2 litre/minute, and precursor’s concentration 0.5 M and also various variable of doping’s concentration. Spray pyrolysis have several major components, such as droplet generator, controlled heated furnace, and particle collector. Droplets produced by ultrasonic nebulizer from precursor solutions will be flown by air as the carrier gas into a tubular furnace reactor equipped with temperature control equipment. The particles produced from the reactor will be captured by the electrostatic precipitator as a particle collector, then the residual gas will be flowed into the water trap for gas washing so that gas is safe to be discharged to the outside air.

After that, the aluminium zinc oxide (AZO) product will be analyzed its morphology (shape and size) by using Scanning Electron Microscope (SEM), its degree of crystallinity by using X-Ray Diffraction (XRD), its optical properties by using UV-vis
spectrophotometer and its conductivity by using Four Point Probe.

Results from the study showed that the addition of Al Sulfate doping produce particles with a more smooth morphology than other doping appeal, the higher doping concentration used, the value of crystallite size will be smaller, the next highest percent transmittance occurred during the addition of doping Al with Al doping source Al Sulphate, Al Nitrate, and Al Chloride at the same concentration of 2% at. For the four-point probe analysis of the three types of doping source, ZnO:Al particles are semiconductor materials.

**Keywords**: Aluminium zinc oxide (AZO), Spray Pyrolysis, doping