PREPARATION OF ELECTRICALLY CONDUCTIVE PET FILM WITH AL-DOPED ZINC OXIDE NANORODS

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Transparent conductive oxides (TCOs) films are of considerable interest for many electrical and phtotoelectrical applications such as various conductive oxide electrodes, gas sensor, photoelectronic display devices, solar cells and energy efficient windows. There are various techniques to deposit TCO film on a substrate surface including chemical vapor deposition, physical vapor deposition, electron beam evaporation, sputtering and wet coating. Recently, wet coating has been much attention which is an easy way to fabricate large-area film and simple process and cost effective compare to dry coating methods. Among the various transparent and conductive oxides for antistatic coating materials, zinc oxide has possibility of transparent conducting material in place of indium tin oxide (ITO), if we could control its performance and stability. Zinc oxide is a versatile material with many applications including transparent electrode in solar cells, gas sensors and photo-luminescence devices. Generally, Zinc oxide nano particles are prepared by two methods, traditional solid state reaction and wet chemical methods. Also, the benefits of a utilizing solution-based method have also involved the considerable influence of reaction species on the size and morphology. In this aspect, many of the previous investigations on pure and transition metal doped ZnO prepared by solution based method, mainly utilized zinc hydroxide or salt as precursors and water or organic solvent as reaction media. Herein, we present microemulsion method toward the growth of well-proportioned and crystallized pure and aluminum doped ZnO nanorods using amphiphile as the modifying and protecting agent. The synthesis of aluminum doped ZnO nanorod was carried out in microemulsions, which were consisting of 5g of amphiphile such as dodexyl benzne sulfonate and 2 mmol of $ZnAc_2 \cdot 2H_2O$ both dispersed in 60 ml xylene by stirring until a homogenous slightly-turbid appearance of mixture was obtained. After aluminum precursor (aluminum nitrate nonahydrate) was added depend on the doping ratios. Then hydrazine monohydrate 2 ml and ethanol 8 ml mixture solution was added drop-wisely to the well-stirred mixture at room temperature by simultaneous agitation. The resulting precursor-containing mixture was subsequently heated to the 140℃ for refluxing. After refluxing for 5 hours, a milky-white suspension was obtained and centrifuged to separate the precipitate, which was rinsed with absolute ethanol and distilled water for several times and dried in vacuum oven at 70℃ for 24 hours. In the present study, a conductive film was fabricated using aluminum doped zinc oxide nanorods by the wet coating method. We investigated electrical and optical properties of the film.

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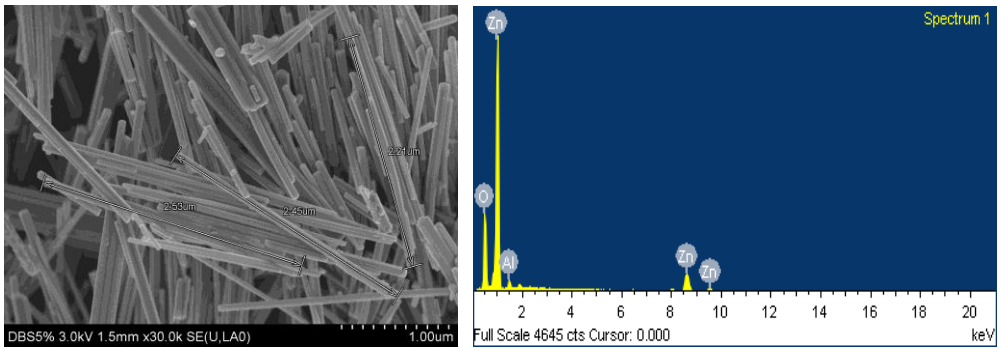

Figure 1. FE-SEM and EDX images of AZO nanorods.

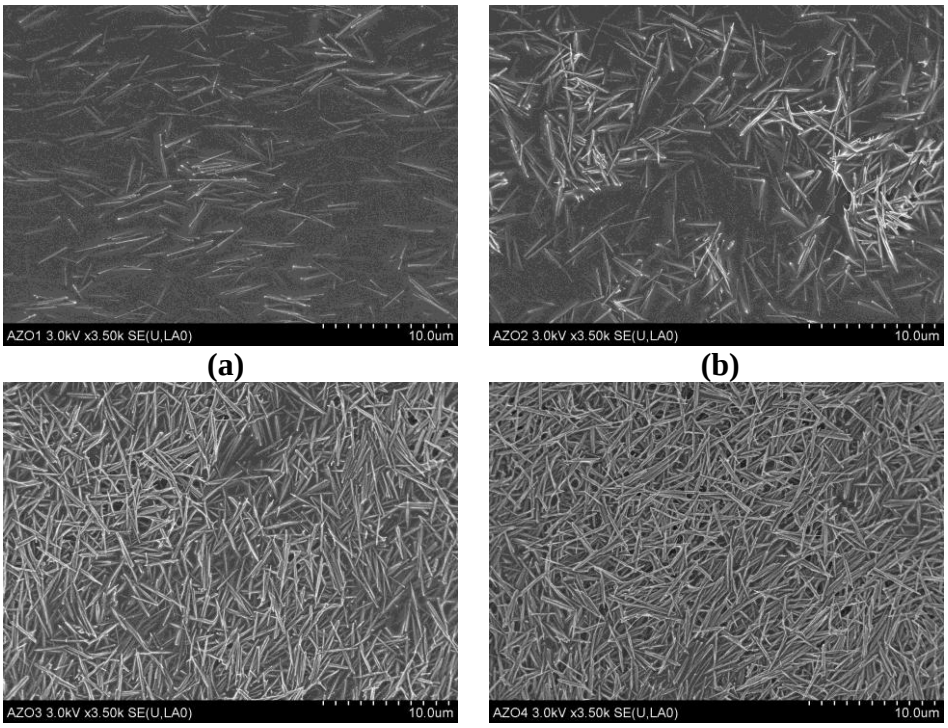

Figure 2. FE-SEM images of surface morphology of AZO nanorods coated film. (a) 3 wt.%, (b) 5 wt.%, (c) 7 wt.%, (d) 10 wt.%.