Highly Induced Electrical, Morphological, and Optical Characteristics of PEDOT:PSS Film Fabricated by Hot-Casting Technique

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PEDOT:PSS is a widely used conductive polymer in the field of photoelectric devices. However, the films fabricated by ordinary methods such as spin casting have adverse performance, therefore, cannot be used as a transparent electrode. Since it was reported that PEDOT:PSS film has sporadically located grains, aggregated grains lead to physical enhancement of film. Hot-casting(HC) was performed by spin-casting a room temperature solution on a hot glass substrate, by moderating its temperature from 373K to 453K with an interval of 20K. Electrical, morphological, and optical characterization was performed to evaluate its applicability as a transparent electrode, by using a 4-point probe, atomic force microscope(AFM), UV-Vis spectrophotometer, respectively. Electrical conductivity was greatly enhanced from 1270S/cm to 3240S/cm, which was 156% increased. The sheet resistance was significantly decreased from 66.7O/sq to 26.2O/sq. The morphology was compared quantitatively with root-mean-square depth. While that of the as-formed film was 1.121nm, 453K HC film showed 14% decreased figure of 0.822nm. Both as-formed and 453K HC film have a higher transmittance than ITO at 550nm, which was 85.36% and 85.06% respectively while that of ITO was 84%. Taken these results altogether, modified PEDOT:PSS film satisfies the requirements of the transparent electrode. Energy dispersive spectroscopy results of each film together with AFM image provides a great insight to the origin of these improvements, which is an aggregation of grains eventually lead to the overlapping among the conductive PEDOT-rich core of grains. Aggregated grains was observed in AFM image of HC film. These results of induced PEDOT:PSS film suggests to photoelectric devices can adopt it as a transparent electrode.

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