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Author: F. Zabihi Y. Xie S. Gao M. Eslamian

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Morphology, Conductivity and Wetting Characteristics of PEDOT:PSS Thin Films Deposited by Spin and Spray Coating

F. Zabihi, Y. Xie, S. Gao, M. Eslamian¹

University of Michigan-Shanghai Jiao Tong University Joint Institute, Shanghai, 200240, China

Highlights

1. Nano-structure of spun-on and spray-on PEDOT:PSS thin films are studied.
2. A correlation is established between the film nano-structure and electrical conductivity.
3. Effect of process parameters are studied on the film characteristics
4. A high solution concentration, high process temperature and multiple deposition layers are recommended.

Abstract:

The goal of this paper is to study the characteristics of PEDOT:PSS thin films and the effects of varying the processing parameters on the structure, functionality, and surface wetting of spun-on and spray-on PEDOT:PSS thin films. PEDOT:PSS is a polymer mixture, which is electrically conductive and transparent and, therefore, is an attractive material for some optoelectronic applications, such as organic and perovskite solar cells. The films are fabricated using spin coating (a lab-scale method) and spray coating (an up-scalable method). The effects of spinning speed, drying time and post-annealing temperature in spun-on samples, and the effects of the substrate temperature and number of spray passes (deposition layers) in spray-on samples, as well as, the effect of precursor solution concentration in both cases are investigated. Various characterization tools, such as AFM, SEM, XRD, Confocal Laser Scanning Microscopy (CLSM) and electrical conductivity measurements are used to determine the film roughness, thickness, structure and morphology. The solution precursor physical data, such as contact angle on glass

¹ Corresponding author, Email: Morteza.Eslamian@sjtu.edu.cn (M. Eslamian); Tel: +86-21-3420-7249; Fax: +86-21-3420-6525

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