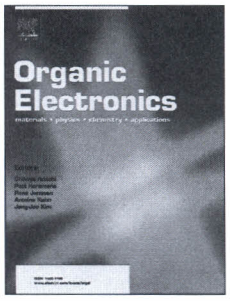
Accepted Manuscript



The impact of solvent doping on the morphology and performance of spray-coated PEDOT:dPSS: A USANS and SANS study

Thusitha Etampawala, Mehran Tehrani, Ali Nematollahi, Lilin He, Mark Dadmun

PII: S1566-1199(17)30424-X

DOI: 10.1016/j.orgel.2017.08.030

Reference: ORGELE 4277

To appear in: *Organic Electronics*

Received Date: 6 July 2017

Revised Date: 23 August 2017

Accepted Date: 25 August 2017

Please cite this article as: T. Etampawala, M. Tehrani, A. Nematollahi, L. He, M. Dadmun, The impact of solvent doping on the morphology and performance of spray-coated PEDOT:dPSS: A USANS and SANS study, *Organic Electronics* (2017), doi: 10.1016/j.orgel.2017.08.030.

The Impact of Solvent Doping on the Morphology and Performance of Spray-coated PEDOT:dPSS: A USANS and SANS Study

*Thusitha Etampawala[#], Mehran Tehrani, Ali Nematollahi, Lilin He, and Mark Dadmun**

Dr. T. Etampawala, Prof. M. Dadmun
Department of Chemistry, University of Tennessee, Knoxville, TN, 37996, USA
E-mail: dad@utk.edu
[#]Current Address: Instrumental Analysis Division, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
Dr. M. Tehrani, A. Nematollahi
Advanced Structural and Energy Materials Laboratory, Department of Mechanical Engineering, University of New Mexico, Albuquerque, NM, 87131, USA
Dr. L. He
Biology and Soft Matter Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831, USA
Prof. Mark Dadmun
Chemical Science Division, Oak Ridge National Laboratory, Oak Ridge, TN, 37831, USA

Keywords: organic thermoelectrics, PEDOT:PSS, neutron scattering, structure-property relationships

Abstract

Poly(3,4-ethylenedioxythiophene):poly(styrene sulfonate) (PEDOT:PSS) is used in a broad range of organic electronics devices, where their performance can be dramatically enhanced by solvent processing. The morphological changes that occur with solvent processing, as well as the impact of deposition technique, are not well understood, but this understanding is crucial to rationally tune the performance of PEDOT:PSS. In this study, the change in the morphology and conductivity of spray-coated PEDOT:PSS films with pre- and post-deposition processing in the presence of polar solvents is investigated by means of neutron scattering. Deuterium labeling of PSS is used to distinguish between the PEDOT and PSS phases. Changes in the morphology of PEDOT:deuterated PSS (PEDOT:dPSS) films with the addition of 5% dimethyl sulfoxide (DMSO) to the pre-deposition PEDOT:dPSS solutions enhances the conductivity by *ca.* 60-fold, and is further enhanced by *ca.* 2-fold by soaking the films in ethylene glycol (EG). Neutron scattering reveals that the morphology of the spray-coated PEDOT:dPSS film consists of a two-phase structure on the micron to nanometer length