Poster Presentation

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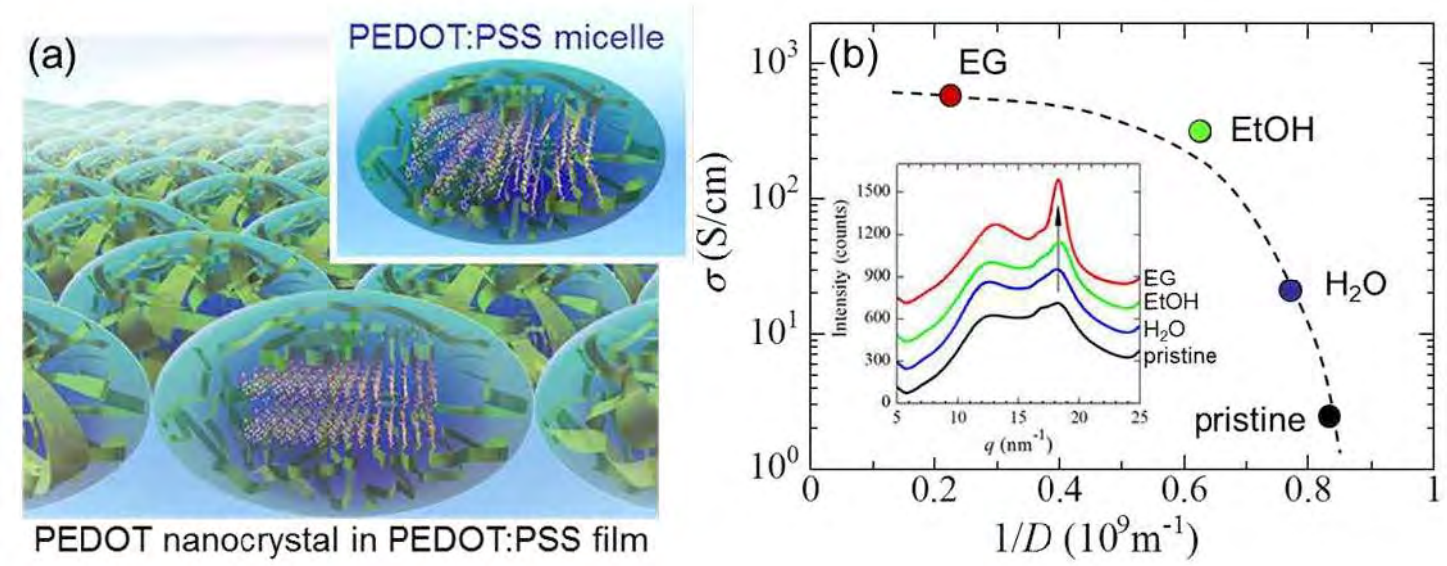
Nanocrystallization and Electronic-Conductivity Enhancement in PEDOT:PSS films

A. Fujiwara[1], H. Masunaga[1], H. Okuzaki[2], Y. Honma[3], T. Sasaki[3]

[1]Japan Synchrotron Radiation Research Institute/SPring-8, Research and Utilization Division, Sayo, Japan, [2]University of Yamanashi, Interdisciplinary Graduate School of Medicine and Engineering, Kofu, Japan, [3]Tohoku University, Institute for Materials Research, Sendai, Japan

The conductive organic polymer, poly(3,4-ethylenedioxythiophene):poly(4-styrenesulfonate), abbreviated as PEDOT:PSS, is widely used in capacitors, antistatic coating etc. and one of the potential materials for the next-generation printable electronics. It is because of its excellent dispersibility in water and high electronic conductivity of more than 1,000 S/cm. Although many preceding studies have provided a variety of possible mechanisms of high conductivity, such as charge transfer between PEDOT and residual solvents, there has been no conclusive explanation for the origin of the high conductivity. Here, we report the nanometer-size crystallization of PEDOT inside the hydrophobic core region of PEDOT:PSS in a solid film and enhancement of electronic conductivity caused by the nanometer-size crystal growth of PEDOT. The structure of PEDOT:PSS has been investigated by means of small- and wide-angle X-ray scatterings (SAXS and WAXS) using high brilliance synchrotron radiation light source in SPring-8, Japan. We have obtained the microscopic structural model of PEDOT:PSS micelle in the water dispersion and the solid polymer film (Fig. 1(a)). Nanometer-size crystals of PEDOT were grown during the course of film fabrication in the wet process from the water dispersion. Furthermore, we found that the better crystallinity of the PEDOT crystal in the films prepared in the different conditions resulted in the higher electrical conductivity (Fig. 1(b)). The result suggests that the size of the crystallite is one of the key parameters for the enhancement of the electronic conductivity in PEDOT:PSS films. These findings shed light on the further improvement of the electrical conductivity of PEDOT:PSS polymer films by controlling the evaporation to dryness in the wet fabrication process.

[1] *T. Takano, H. Masunaga, A. Fujiwara, H. Okuzaki, T. Sasaki, Macromolecules, 2012, 45, 3859-3865.*



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