CEMSUPRA 2018

超分子化学と機能性材料に関する国際シンポジウム 2018

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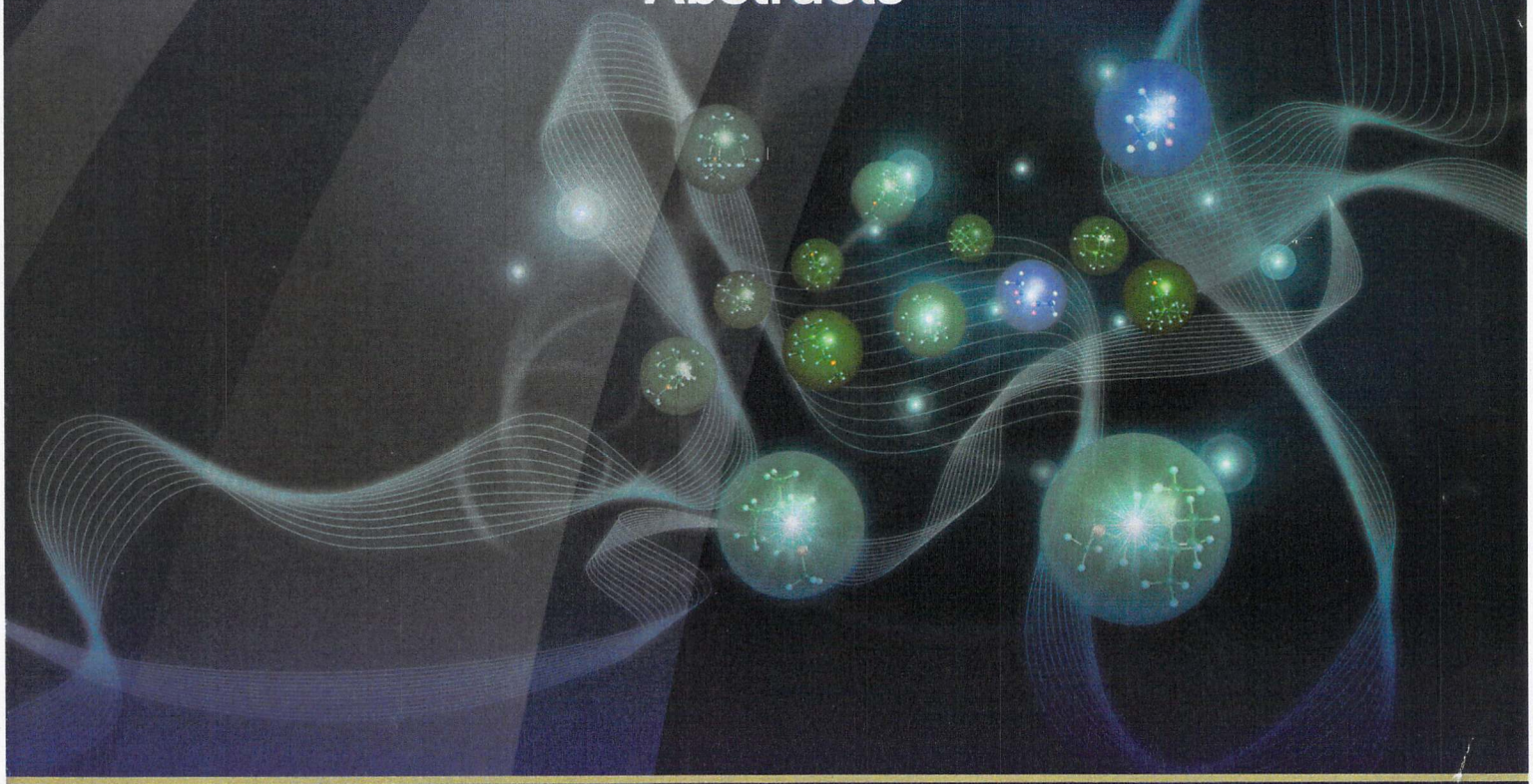
Abstracts



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Nanoporous Thin Films of PEO-Containing Side-Chain Liquid-Crystalline Block Copolymers with Organic Semiconductor

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Block copolymers (BCPs) are widely known as an excellent bottom-up approach for fields of nanotechnology applications.[1] BCPs with immiscible segments are capable of self-assembly into various highly ordered nanostructures (i.e. sphere, cylinder, double gyroid and lamella) with suitable volume fractions and Flory-Huggins interaction parameters. The purpose of this work is to utilize the structures provided by BCPs self-assembly to optimize morphology of active layers for organic photovoltaics (OPVs). The power conversion efficiencies of conventional OPVs often suffer from the disordered morphology of active layers, which are prepared by spin-coating from blend solutions of electron donors and acceptors. We developed a block copolymer with side-chain liquid-crystalline oligothiophenes as donor materials (Fig. 1). The block copolymer thin films exhibited clear phase-separated structures upon thermal annealing, of which domain size is almost 20 nm (Fig. 2b). Hydrophilic poly(ethylene oxide) (PEO) block was removed by immersing the annealed films in potassium hydroxide (KOH) solution for the cleavage of ester bonds (Fig. 2c).

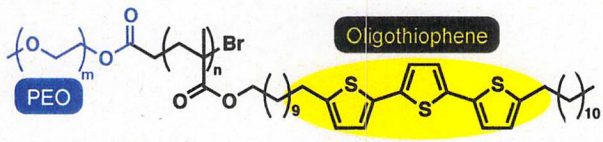

Fig. 1 Block copolymer with organic semiconductor.

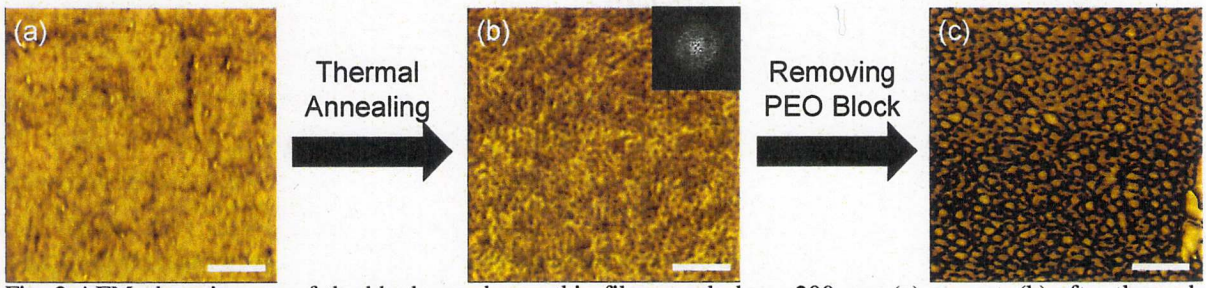

Fig. 2 AFM phase images of the block copolymer thin films; scale bars: 200 nm. (a) as-cast, (b) after thermal annealing, (c) KOH treatment.

(1) H. Kim, S. Park, W. Hinsberg, *Chem. Rev.* **2010**, *110*, 146.

Naoto Yanahashi graduated from Department of Applied Chemistry at Chuo University in March 2016. He has been a graduate student in the group of Prof. Ikeda at Chuo University since April 2016. His main research interests focus on control of active layer for enhancing the power conversion efficiencies in OPVs.