# Block Copolymer Thin Films: Nanotemplates for New Functional Nanomaterials

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## ABSTRACT

Self-assembled nano-structured materials consisted of organic, inorganic, and polymeric compounds have been extensively investigated. Among many different types of self-assembled materials, block copolymers with well-defined nanoscopic structures have recently gained much attention for their potential uses as functional nanostructures.

In this talk, I will address on future applications of the block copolymer thin films: nanotemplates for high density storage media, PN heterojunction photovoltaic devices, and separation membranes for biomaterials. To achieve this objective, cylindrical nanodomains in block copolymer should be perpendicularly oriented to a substrate. We obtained the perpendicular cylindrical nanodomains in polystyrene-*block*-poly(methyl methacrylate) copolymer films with a thickness as high as 300 nm by the addition homopolymer of PMMA. We observed that the hexagonal packing of nanodomains spanned the entire thickness of the film. We obtained nanoporous templates after removing the PMMA nanodomains by UV treatment. The nanoporous templates were analyzed by using grazing incidence X-ray scattering as well as transmission electron microscopy.

By using electropolymerization, high density nanowire arrays with diameters of 25 ~ 40 nm of conducting polymer of poly(pyrrole) and poly(3,4-ethylenedioxythiophene) were obtained and their electric properties (HOMO and LUMO levels) were measured. Also, these nanoporous thin films were found to be very useful for the separation of human Rhinovirus type 14 (HRV 14), major pathogen of a common cold in humans, from the buffer solution.