Microphase-separated Polymeric Materials for Applications to fuel cells, solar cells, batteries and separation membranes

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Our work has been devoted to the study of polymeric materials, particularly self-organizing and nanostructured polymer systems, for applications including fuel cells, solar cells, rechargeable batteries and separation membranes. The "grafting from" technology to prepare the well-defined microphase-separated structure of polymeric materials using atom transfer radical polymerization (ATRP) will be introduced in this presentation. Various amphiphilic comb copolymers were synthesized through this approach. Graft copolymers incorporating proton conducting groups are being explored as polymer electrolyte membranes for fuel cells. The structure of proton transport channels has been controlled and fixed by crosslinking the hydrophobic domains, which also provides the greater mechanical properties of membranes. These materials can also serve as the structure-directing agents for nanocomposite electrodes. We also investigate supramolecular polymers containing quadruple hydrogen bonding sites and their uses as polymer electrolytes for dye sensitized solar cells.