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Bio-inspired, microchanneled materials prepared by crystallization of solvents

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Microporous polymeric materials in nature have well-controlled structures of skeletal walls and pores for their functions. The structures of man-made microporous polymers are commonly limited to isolated porous architecture, although they have continually been developed for the critical roles in various industries. The directional melt crystallization of solvent, a relatively new versatile preparation method to produce aligned pores in the forms of 3D patterns, has produced porous structures of Voronoi and honeycomb-like architecture morphology. By applying this technique to polymers, we have produced various materials having ordered microchannels. Crystallization rate and direction have been carefully controlled in a home-made apparatus to prepare defect-free materials having well-ordered through-thickness microchannels. From polymer solutions or dispersions, solutes become skeletal portion and crystallized solvents become pores after sublimation. The free-standing membranes of 60-90 vol% through-thickness porosity could be prepared without having internal microcracks. With the support of nanotemplates, nanospheres, nanorods, and nanomembranes could be prepared too. Controlling pore morphology by directional freezing offers a versatile route to prepare unique porous polymer and composites for future biomedical, electronics and environmental applications.

Biography

Jonghwi Lee obtained his PhD degree in University of Michigan, Ann Arbor and worked for Merck Research Laboratories as a Senior Researcher after his Postdoctoral training at the University of Minnesota. He has won prizes from The Polymer Society of Korea (Best Paper Award), Korean Society of Industrial Engineering Chemistry (Contribution Recognition Award, Best Paper Award, Best Industry Collaboration Award), and Chung-Ang University (Excellence in Achievement Award, Bae Young Soo Award). He has published more than 150 research papers, and currently a Vice Editor of *Journal of Industrial and Engineering Chemistry* (IF = 4.179) and *Macromolecular Research*.

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