

Flexible and Actuating Nanoporous Poly(Ionic Liquid)–Paper-Based Hybrid Membranes

Abstract

Porous and flexible actuating materials are important for the development of smart systems. We report here a facile method to prepare scalable, flexible actuating porous membranes based on a poly(ionic liquid)-modified tissue paper. The targeted membrane property profile was based on synergy of the gradient porous structure of a poly(ionic liquid) network and flexibility of a tissue paper. The gradient porous structure was built through an ammoniatriggered electrostatic complexation of a poly(ionic liquid) with poly(acrylic acid), which were previously impregnated inside the tissue paper. As a result, these porous membranes undergo deformation by bending in response to organic solvents in the vapor or liquid phase and can recover their shape in air, which demonstrates their ability to serve as solvent sensors. Besides, they show enhanced mechanical properties due to the introduction of mechanically flexible tissue paper that allows the membranes to be designed as new responsive textiles and contractile actuators.

