FUNCTIONAL POLYMERS IN OUR ENERGY FUTURE

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ABSTRACT

Functional polymers play a key role as advanced materials in many renewable energy applications, for both, generation and storage. They include areas such as selective proton conducting polymers as membrane electrode assembly for use in fuel cells, selective lithium ion transporting separator assembly and as anodes and cathodes in Li-ion batteries.

Porosity is a profound and, yet, ubiquitous concept that is inherent in all materials, both, natural and synthetic. Biomaterials (skin, alveoli in the lungs), inorganic frameworks (zeolites, carbon, silica, clay), organic frameworks (supramolecular assemblies), plant materials (bamboo) and synthetic polymer membranes (water desalination membranes, kidney dialysis membrane) are all notable for their exquisite porous architectures which are critical to its structure and functions. Porosity in polymers can be created either during its synthesis or by modifying preformed dense polymers by techniques, such as, phase inversion, templating, self assembly and electrospining.

This lecture will present an overview of challenges encountered in building porosity in polymers. Synthesis of functional polymers with intrinsic microporosity will be described as a method for creating more efficient MEA's for high temperature fuel cell applications. Use of meso/macro porous functional polymers as separators for Lithium ion battery will be described. Work currently in progress in author's laboratory in the preparation of porous polymers will be presented with a special focus on energy conversion and storage applications. Functional polymers with unique performance as anode materials in a lithium ion battery will be presented.