POLYMER MEMBRANE SEPARATORS FOR NEXT GENERATIONS ENERGY-WATER SYSTEMS

Sandia National Laboratories

US Pat. No.: 7,888,397; 8,809,483; 8,110,636; 7,301,002; 7,816,482, additional patents pending
Technology Readiness Level: 4/5
Basic technological components have been integrated to establish the pieces will work together

Polymer membrane separators play a crucial function in many energy and water technologies including: energy storage, hydrogen generation through water electrolysis, and fuel cell based stationary and transportation power systems. The cost and performance of current polymer membranes have hindered the widespread adoption of these clean energy technologies. Sandia's inexpensive poly(phenylene)-based hydrocarbon polymer membrane separator was developed to encourage increased implementation of these next-generation of energy-water systems.

Sandia's membrane technology starts with a poly(phenylene) backbone that is chemically functionalized based on the intended application which greatly reduces manufacturing costs. For instance, the membrane can be optimized for transportation of protons (H+) or hydroxyl ions (OH-) depending on the acidic or alkaline environment of the energy-water system. To further reduce costs, the membrane is designed to eliminate the need for precious metal catalysts.

This technology can reduce costs associated with stationary energy storage and promote growth of renewable energy sources while providing grid stability. It also provides a more efficient, cheaper alternative to membranes currently used in fuel cell vehicles which are becoming strong competitors to electric vehicles due to their shorter refueling times and longer driving ranges.

This is the first membrane technology of its kind to demonstrate superior performance and cost savings over current state-of-the-art. Sandia's innovative membrane has the potential to change the landscape in fuel cell and water electrolysis systems and can usher in a new era of clean technologies.

TECHNICAL BENEFITS

- Reduced manufacturing cost
- High ion conductivities
- Reduced cross-over
- Operates over a wide range of temperatures
- Chemical and thermal stability in acidic and alkaline environments

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