

Progress and Challenges in Membrane-free Redox Flow Batteries

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Abstract : Redox flow batteries (RFBs) are seen as a promising energy storage technology for grid-scale applications since RFBs possess flexibility, fast response, and safe operation but are not dependent on geographical factors and do not involve enormous capital investment. RFB systems featuring different redox couples have been studied, tested, and demonstrated at varied scales around the world within the last three decades. However, cost-effectiveness has remained a challenge to RFBs in practice. Membrane-free RFB systems utilize a single electrolyte and, therefore, no need for membranes, which enables systems to simplify the design significantly, reduce cost, and ease maintenance. A number of membrane-free RFB systems have been proposed and reported since 2004. This presentation provides an overview of membrane-free RFB technology and chooses three examples, namely soluble lead-acid, zinc nickel, and hydrogen bromine systems, to demonstrate key features, chemistry, progress and technical challenges in the membrane-free RFB systems.

Keywords : energy storage, redox flow battery, membrane-free redox flow battery, fuel cells

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