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Recent Progress in Organic Redox Flow Batteries: Active Materials, Electrolytes and Membranes

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Abstract

Redox flow batteries (RFBs) have great potentials in the future applications of both large scale energy storage and powering the electrical vehicle. Critical challenges including low volumetric energy density, high cost and maintenance greatly impede the wide application of conventional RFBs based on inorganic materials. Redox-active organic molecules have shown promising prospect in the application of RFBs, benefited from their low cost, vast abundance, and high tunability of both potential and solubility. In this review, we discuss the advantages of redox active organic materials over their inorganic counterpart and the recent progress of organic based aqueous and non-aqueous RFBs. Design considerations in active materials, choice of electrolytes and membrane selection in both aqueous and non-aqueous RFBs are discussed. Finally, we discuss remaining critical challenges and suggest future directions for improving organic based RFBs.

Keywords: Organic materials; electrolyte; membrane; flow battery; low cost.

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