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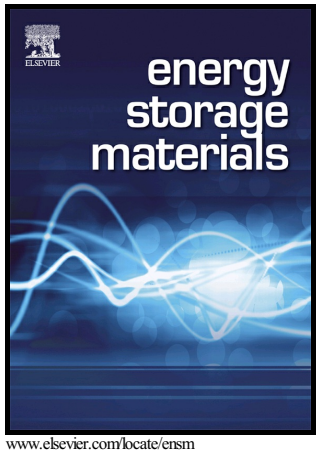

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Energy Efficient Na-Aqueous-Catholyte Redox Flow Battery

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ABSTRACT

Redox flow battery (RFB) technologies have become play a significant role in the future for the storage of electrical energy produced from intermitted renewable energies such as solar, wind, and hydroelectric powers. Although the development of high-energy density RFB remains a challenging. Herein, we report the Na-aqueous-catholyte RFB (NaAqRFB) towards high-density electrical energy storage. Na-metal anode offers a high energy density and the use of an aqueous flowing catholyte decouples the energy and power. NASICON ($Na_3Zr_2Si_2PO_{12}$) is employed as a solid electrolyte in the NaAqRFB to separate the Na anode and a flowable aqueous catholyte. The constructed prototype NaAqRFB operates using a sodium-hexacyanoferrate solution as the aqueous catholyte with no added supporting salt/electrolyte, and yielded an average cell potential of ~3.06 V (vs. Na/Na^+), and an energy density of 54.16 Wh L^{-1} (based on the volume of catholyte) with high energy efficiency (~92%, over 50 cycles), outperforming conventional

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