Beyond Metal–Air Battery, Emerging Aqueous Metal–Hydrogen Peroxide Batteries with Improved Performance

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Abstract

The aqueous metal-H2O2 batteries have been paying rapidly increasing attention due to their large theoretical energy densities, high power density, and multiple applications (air, land, and sea), especially in low-content oxygen or nonoxygen conditions in which metal-air cells are out of work. However, the requirements of metal-H2O2 batteries are different due to the order of metal activities (Mg>Al>Zn) as well as metal-air cells. Aqueous metal-H2O2 batteries mainly include Al-H2O2, Mg-H2O2, and Zn-H2O2 batteries with respective scientific problems, including battery structures, single/dual-electrolyte systems, electrocatalysts for oxygen reduction/evolution reactions and H2O2 reduction/production/decomposition, and the designability of anode to inhibit self-corrosion. In this review, we summarized battery architectures, possible mechanisms, and recent progress in metal-H2O2 batteries including Al-H2O2, Mg-H2O2, and Zn-H2O2 batteries. Several perspectives are also provided for these research fields, which may be focused on in the future.

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