Influence of additives on the reversible ORR / OER in the magnesium containing ionic liquid N-Butyl-N-methylpyrroloidinium bis(trifluoromethanesulfonyl)imide

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Abstract

Aiming at a better understanding of the processes in future Mg-air batteries we have investigated the influence of different additives on the ORR/OER in magnesium containing BMP-TFSI on a glassy carbon electrode. Specifically we focus on the complexing agent 18-crown-6, which can complex the magnesium ions and thus hinder the passivation caused by their reaction with ORR products such as superoxide and peroxide anions. Furthermore, to inhibit electrode passivation by reaction with trace impurities of water, we added borane dimethylamine complex (NBH) as potential water-removing agent. The electrochemical processes were characterized by differential electrochemical mass spectrometry (DEMS) to monitor the consumed and evolved \text{O}_2 in the ORR/OER and thus to determine the number of transferred electrons. Crown ether and also NBH were found to efficiently mask the Mg\textsuperscript{2+} ions when used over-stoichiometrically, reducing the formation of a passivation layer, while too high concentration reduced the reversibility of the ORR/OER.

Keywords: ORR, OER, ionic liquids, BMP-TFSI, Mg-air battery

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