Performance and long term stability of a liquid-tin anode metal-air solid electrolyte battery prototype


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ABSTRACT

A High-Temperature Metal-Air Battery (HTMAB) prototype based on a simple redox reaction between molten Sn and atmospheric oxygen at 800 °C is presented, using yttria doped zirconia as solid electrolyte. Basic reversibility measurements indicate that the electrochemical reactions in the device are reversible with coulombic efficiencies higher than 95%. Significant influence of the cycling rate in the delivered capacity is detected; specifically it is increased from 8 to 90 mAh cm⁻² when reducing the discharge current from 12.5 to 0.56 mA cm⁻². EIS analysis performed over cycling shows that anode diffusion polarization increase due to sealing deficiencies is the main cause of degradation. Anyway, the electrochemical Sn oxidation/reduction reaction remains reversible for more than 4500 charge-discharge cycles and 6000 hours operating at 800 °C.

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