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Evaluation of shelf life of commercial Li/SO₂ battery by electrochemical impedance spectroscopy

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Li/SO₂ batteries are attractive because they have high energy density, excellent low temperature performance and long storage life [1]. In this type of electrochemical power source, respectively, anode and cathode are metallic Li and SO₂ gas which dissolved on a nonaqueous organic electrolyte. Undesirable chemical reactions, including self-discharge, corrosion, and degradation of battery materials, can occur during storage of a battery, and cause drop off the battery capacity and energy [2]. So a non destructive method for estimation of state of charge (SOC) and/or state of health (SOH) of this type battery is important. The electrochemical impedance spectroscopy (EIS) techniques have been widely used for investigating the SOC and/or SOH of batteries because of its nondestructive behavior [3]. In this work, the EIS behavior for the commercial Li/SO₂ cells (Saft) were studied in the lab temperature at various SOC values in the frequency range of 100 kHz-10 mHz. All the cells were discharged under 350 mA constant current. The data comprise an inductive part in the high frequency region, which is attributed to the porosity of cathode electrode. All data were analyzed using an equivalent circuit and a nonlinear least square fitting procedure, and the impedance parameters were evaluated. The results shown that total impedance corresponding to the high frequency of the cells, showed a good dependence on the SOC of the cell in the region of 100- 40 %.

Reference

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