Neutron Tomography Study of Lithium Peroxide Distribution on Carbon Foam

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Abstract

Despite tremendous theoretical capacity (11,200 mAh/g, without oxygen), lithium-air cells have very limited to no cyclability due to host of issues. Notable problems in the area of air cathodes range from the transport of dissolved oxygen species across the spatial thickness of the air-cathode to the formation of discharge product, Li_2O_2, in the pores and at the interfaces. We report for the first time the reconstructed 3D tomography neutron imaging of lithium (peroxide) coated on the walls of porous carbon foam demonstrating the feasibility of this technique to characterize the formation and spatial distribution of lithium oxide in air cathodes. Given the sensitivity of neutrons to various atoms, the porous carbon foam hardly contributes to neutron signal thus imaging only the lithium atoms. The picture below shows the 2D reconstructed cross-sectional slice of Li_2O_2 coated carbon foam. Subsequently, a three dimensional

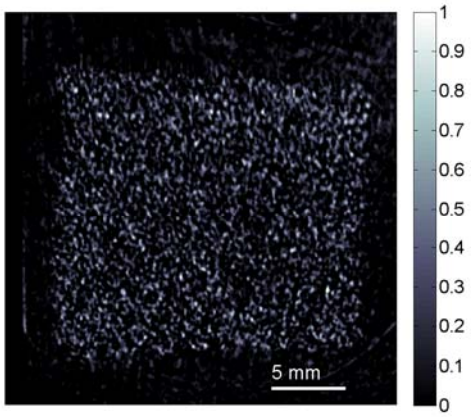

Fig.1 2D neutron image showing lithium distribution on porous carbon foam

set of images of the entire foam was reconstructed showing the lithium distribution across the foam. A semi-quantitative analysis of the lithium concentration across the spatial dimension of the foam will be presented. With improved resolution (~10 micron and below) neutron tomography will provide important spatial and temporal information regarding the discharge product formation and distribution that will help to identify possible reasons for lack of desired rechargeablity of Li-air cells.

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