

**The Electrochemical Behaviors of Manganese Spinel
Electrodes at High Temperature**

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Abstract

Manganese oxide electrodes have drawn enormous attention since it is less expensive compare with cobalt or nickel which is being used in current commercialized cells, and also environmentally benign. However, the capacity fading of LiMn_2O_4 has been major limitation as an electrode, which delays wide acceptance by manufacturers to commercialize. The deterioration of electrochemical performances including capacity loss, impedance arise, and materials instability are more severe at high temperatures above 40-50 °C, which can be easily reached in portable electronic devices or (hybrid) electric vehicles.

The present paper reports our recent research in which we have deliberately design experiment that shows interactions between manganese and carbon electrodes. First, we describe experiments that establish the fundamental electrochemical properties of the manganese spinel electrode in contrast with carbon anode compare with lithium metal anode. In this work carbon anode provides distinct characteristics showing the detrimental reactions with manganese spinel electrode. Subsequently this paper describes our efforts at replacing the carbon anode with $\text{Li}_4\text{Ti}_5\text{O}_{12}$ anode to confirm the fact associated with the interaction of manganese and carbon. The objective with this approach was to provide experimental evidence so that a new way of approach to stabilize manganese spinel electrode could be created.