Distorted Orthorhombic Type Na-Mn-O Cathode Materials

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Lithium resource is not abundant element and unevenly distributed in earth. Indeed, the price of lithium has dramatically surged due to commercialization of lithium batteries for power sources of vehicles and energy storage systems. Sodium resource is possible to be compared with lithium resources as counterpart because sodium is one of the most opulent elements on the Earth. In addition, sodium is the second lightest and smallest alkali metal. Above all, intercalation chemistry of sodium is similar to lithium. For this reason, we decided to attempt to prepare distorted orthorhombic - $Na_{0.67}MnO_2$ based on $Mn^{3+/4+}$ redox reaction synthesized by spray pyrolysis. Sodium layered oxide, $Na_{0.7}MnO_2$, with the distorted orthorhombic (space group: *Cmcm*) type structure was synthesized by an ultrasonic spray pyrolysis method and characterized as positive electrode for sodium batteries. The $Na_{0.67}MnO_2$ electrode delivered a high specific capacity of 228 mAh g^{-1} at 0.05C rate in the 1.5–4.3 V range. The capacity retention after 50 cycles is about 75% in the 1.5–4.3 V range. This reason of high capacity retention would be structural stability of the distorted orthorhombic $Na_{0.67}MnO_2$ electrodes during cycling. In order to confirm this reason, we conducted the *XRD* at first charge/discharge process and after cycling. Furthermore, to verify the manganese oxidation state during sodium intercalation/de-intercalation and the change in local structure of $Na_{0.67}MnO_2$, we conducted the *ex-situ* X-ray absorption spectroscopy (XAS). Details will be discussed in the conference site.

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