

MaMaSELF



Contribution ID: 22

Type: **Student contribution**

Investigation of Li de/insertion in Multi cation substituted Mn-Spinels

The rapid development in the automobile and energy sectors has led to the demand of improved lithium ion batteries. Since the electrochemical performance of a battery is limited by its cathode, therefore, cathode materials with high rate capability, specific capacity and long cycling life are required. Ni-doped Mn spinel (LNMO) materials are promising candidates due to their high intercalation/deintercalation potential, environmental friendliness, low cost and good thermal stability. However, their electrochemical properties are dependent on the crystal structure. It has been previously reported that the disordered LNMO shows better electrochemical performance than the ordered structure. Moreover, doping modifications efficiently enhance the structural stability and rate capability.

In the present work, the synthesis of multi-cation substituted Mn-spinel is aimed to obtain the disordered Fd-3m phase with better electrochemical properties. Sol-gel method is adopted to synthesize $\text{LiNi}_{0.3-x}\text{Cu}_{0.1+x}\text{Fe}_{0.2}\text{Mn}_{1.4}\text{O}_4$ ($x= 0, 0.1$). The effect of different dopant concentrations and annealing temperatures on the structure and electrochemical performance are investigated by different techniques. The structural and morphological investigations are carried out by ex situ X-ray powder diffraction, NMR, and scanning electron microscopy. Along with electrochemical measurements, in-situ XAS is performed to determine active redox couples. The elemental composition and thermal behavior are also studied.

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Session Classification: Student session

Track Classification: Student contribution