Synthesis and Electrochemistry of Cation-Disordered Rocksalt-Type $LiMnO_2$

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Layered oxides with a cation-ordered rocksalt-type structure is widely used as positive electrode materials of rechargeable lithium batteries. Recently, as a non-layered system, cation-disordered rocksalt-type oxides have been proposed as high-capacity positive electrode materials.[1] In this study, cation-disordered $LiMnO_2$ is synthesized from zigzag layered $LiMnO_2$ by mechanical milling, and electrode performance and phase evolution processes are compared with zigzag layered $LiMnO_2$.

X-ray diffraction patterns of $LiMnO_2$ before and after mechanical milling are shown in Figure 1. To improve the electrode performance, the milled sample was mixed with acethylene black (denoted as "carbon composite"). Well defined diffraction patterns are found for as-prepared $LiMnO_2$ with the zigzag layered structure. These diffraction patterns are completely lost after mechnical milling, and cation-disordered rocksalt-type $LiMnO_2$ with low crystallinity is formed. Electrochemical properties of $LiMnO_2$ with different crystal structures (zigzag-layered, after mechanical milling and carbon composite) are compared in Fig. 2. Rocksalt-type and carbon composite $LiMnO_2$ delivers a large reversible capacity of 260 mA h g^{-1}, which reaches >90% of the theoretical capacity. From the results, we discuss the factors affecting electrochemical properties and phase evolution during charge/discharge processes.

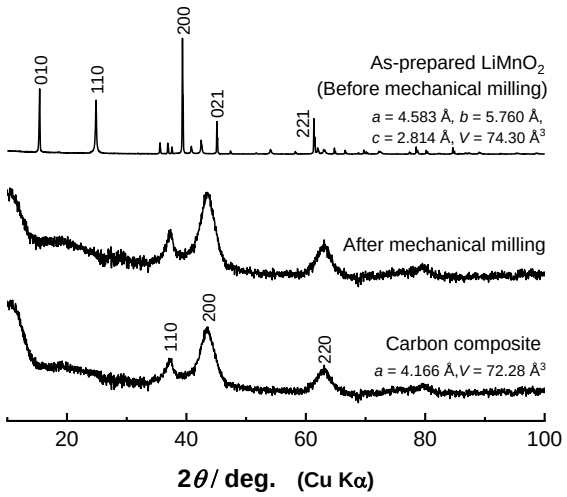

Fig. 1. XRD patterns of $LiMnO_2$; before and after mechanical milling. The milled sample was further mixed with AB to improve electrode properties.

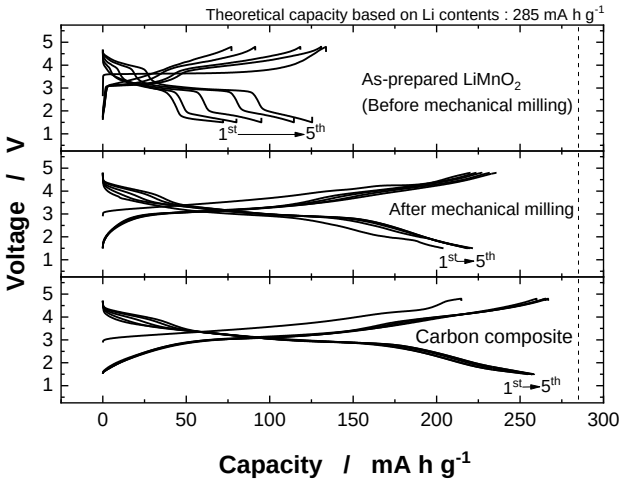

Fig. 2. Charge/discharge curves of $LiMnO_2$ with different crystal structures.

References:

[1] N. Yabuuchi *et al*., *Nature Commun*., **7**, 13814 (2016).