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| Title | Structural transformation and electrochemical study of layered MnO2 in rechargeable aqueous zinc-ion battery. | | |
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| Abstract |  |
| Layered MnO2 is very attractive cathode material for [zinc-ion](https://www.sciencedirect.com/topics/chemistry/zinc-ion) battery (ZIB) due to its large interlayer distance, high discharge capacity, low cost, and environmental benignity. However, layered MnO2 exhibits capacity fading. Therefore, detailed studies of the structural transformation and electrochemical mechanism of layered MnO2 during cycling are urgently required for performance improvement. In this contribution, we have utilized in situ synchrotron, ex situ X-ray diffraction, and ex situ synchrotron X-ray absorption spectroscopy analyses in order to evaluate the structural transformation of a layered MnO2 during Zn-ion insertion. We found that during initial cycles, the [electrode](https://www.sciencedirect.com/topics/chemistry/behavior-as-electrode) was able to maintain its layered structure; however, after prolonged cycles, it completely transformed into an irreversible spinel structure. We also observed the manganese dissolution from the electrode into the electrolyte during continuous cycling. The formation of irreversible spinel phase and manganese dissolution are responsible for capacity fading. Our findings provide the understanding for further improvement of layered MnO2 as cathode material for next generation ZIB systems. | |