Supporting information

Elucidating the Energy Storage Mechanism of ZnMn$_2$O$_4$ as Promising Anode for Li-Ion Batteries

Zijian Zhao*, Guiying Tian*, Angelina Sarapulova*, Vanessa Trouillet$^{a,b}$, Qiang Fu*, Udo Geckle*, Helmut Ehrenberg$^{a,c}$ and Sonia Dsoke$^{a,c, *}$

$^a$Institute for Applied Materials - Energy Storage Systems (IAM - ESS), Karlsruhe Institute of Technology (KIT), Hermann-von-Helmholtz-Platz 1, 76344 Eggenstein-Leopoldshafen, Germany

$^b$Karlsruhe Nano Micro Facility (KNMF), Karlsruhe Institute of Technology (KIT), 76344, Eggenstein-Leopoldshafen, Germany

$^c$Helmholtz Institute Ulm for Electrochemical Energy Storage (HIU), Helmholtzstraße 11, 89081 Ulm, Germany

*Corresponding authors.

E-mail address: sonia.dsoke@kit.edu (S. Dsoke); zijian.zhao2@partner.kit.edu (Z. Zhao)
Fig. S1 Overview of the HT-SXRD and *in situ* SXRD instruments in the P02.1, Petra-III DESY, Hamburg.
Fig. S2 The SXRD pattern of the scan at 800 °C in HT-SXRD and the Rietveld refinement result.
Fig. S3 FESEM image of the cp-ZMO-500 at low magnification.
Fig. S4 *In situ* SXRD patterns of the ZnMn$_2$O$_4$ half-cell during the 1st cycle at a current density of 70 mA g$^{-1}$, referring to the lithiation process (blue) and delithiation process (red);
Fig. S5 In situ SXRD pattern of scan 28 and the Rietveld refinement result.
Fig. S6 EIS Nyquist plots (points) and the fitting curves (solid line) of the 1st cycle of the ZnMn$_2$O$_4$ half-cell.
Fig. S7 The linear relationship between the $Z'$ and the $\omega^{-0.5}$ according to the EIS plots scanned at different (de)lithiation states.
Fig. S8 The selected potential profiles of the long-term cycling at 0.5 A g\(^{-1}\) of the ZnMn\(_2\)O\(_4\) anode.
Fig. S9 (a-d) The CV curves of the ZnMn$_2$O$_4$ half-cell (after 55 cycles) scanned at varied rates 0.1~1 mV s$^{-1}$ with fitted capacitive contribution (shadow area) and (e) linear fitting of the lg(i) vs. lg(v) plots.