

Supplementary Information for

**Phase Transition Kinetics of $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ Electrodes Studied by *In Situ* X-ray
Absorption Near-Edge Structure and X-ray Diffraction Analysis**

Hajime Arai, Kenji Sato, Yuki Orikasa, Haruno Murayama, Ikuma Takahashi, Yukinori
Koyama, Yoshiharu Uchimoto and Zempachi Ogumi

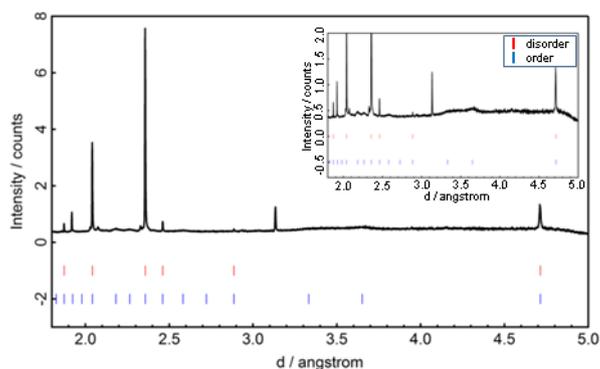


Fig. S1 Neutron diffraction pattern of $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ powder. The inset shows the magnified pattern.

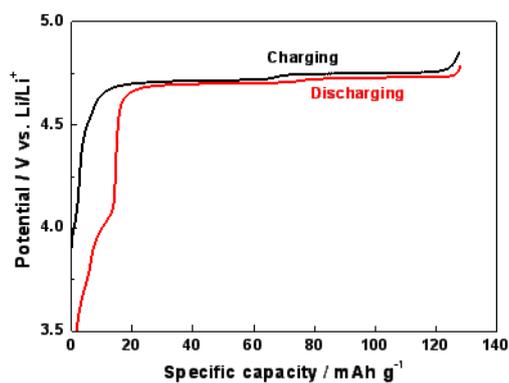


Fig. S2 Potential profiles of $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ electrode during 0.1 C rate charging and discharging.

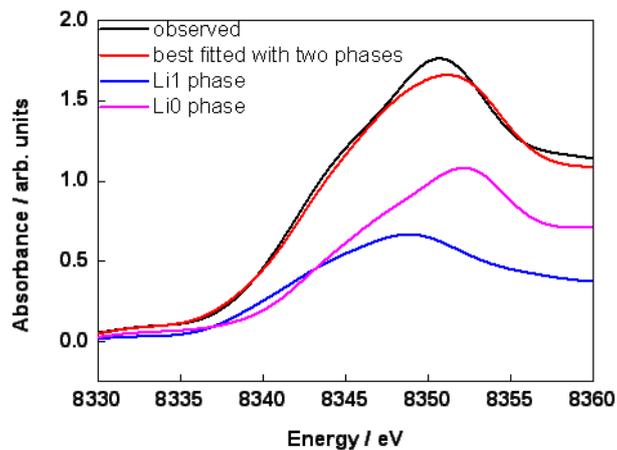


Fig. S3 XANES profile of $\text{Li}_{0.5}\text{Ni}_{0.5}\text{Mn}_{1.5}\text{O}_4$ (Li1/2). The profiles of the $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ (Li1) and $\text{Ni}_{0.5}\text{Mn}_{1.5}\text{O}_4$ (Li0) phases are shown together with the best fitted one to reproduce the profile of $\text{Li}_{0.5}\text{Ni}_{0.5}\text{Mn}_{1.5}\text{O}_4$.

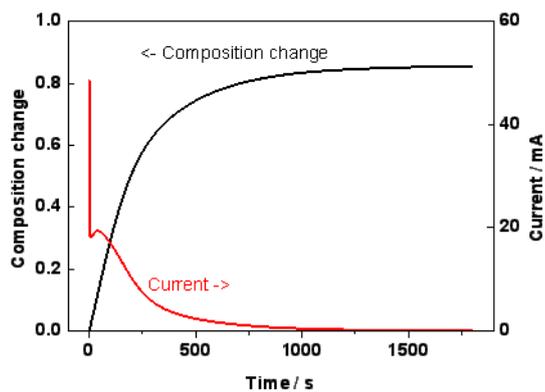


Fig. S4 Lithium composition change and current profiles of $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ electrode during potential step charging experiment from fully discharged state to 4.85 V vs. Li/Li^+ .

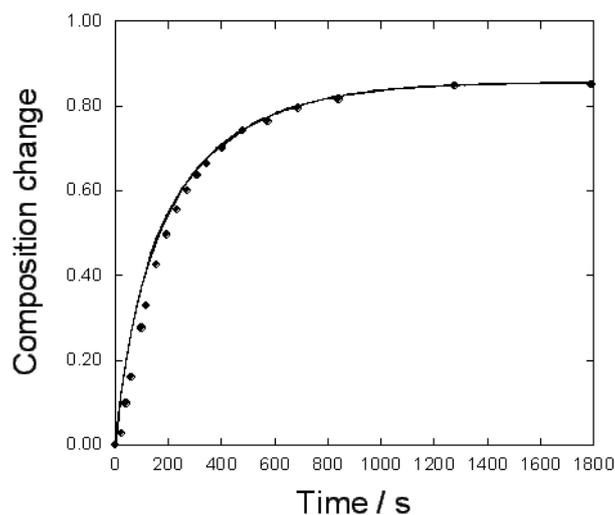


Fig. S5 Lithium composition change of $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ electrode during potential step charging experiment from fully discharged state to 4.85 V vs. Li/Li^+ . The dots and the solid curves are the changes independently evaluated using the experimentally obtained XANES spectra and current responses, respectively.

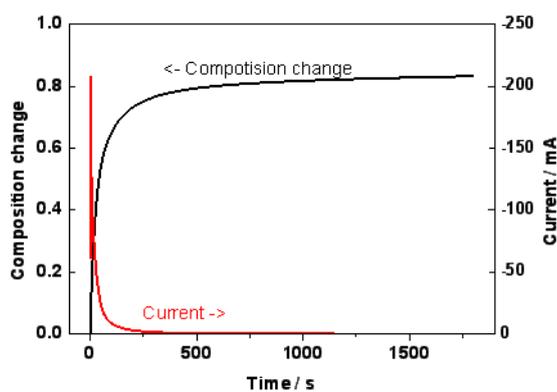


Fig. S6 Lithium composition change and current profiles of $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ electrode during potential step discharging experiment from fully charged state to 3.50 V vs. Li/Li^+ .

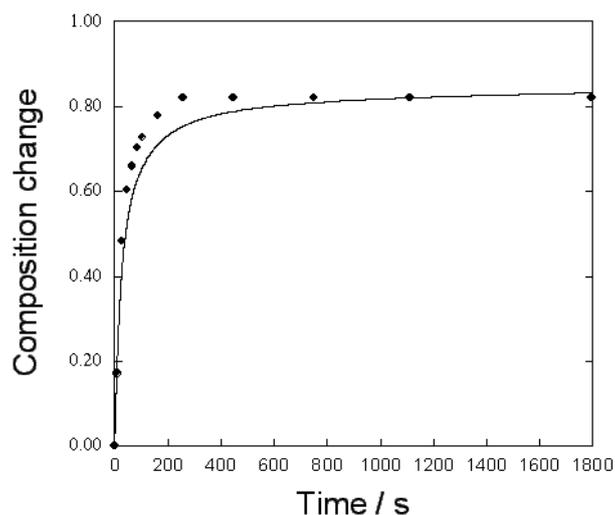


Fig. S7 Lithium composition change of $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ electrode during potential step discharging experiment from fully charged state to 3.50 V vs. Li/Li^+ . The dots and the solid curves are the changes independently evaluated using the experimentally obtained XANES spectra and current responses, respectively.

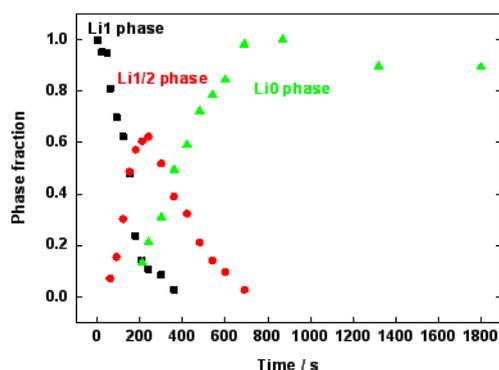


Fig. S8 Phase fractions of $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ (Li1), $\text{Li}_{0.5}\text{Ni}_{0.5}\text{Mn}_{1.5}\text{O}_4$ (Li1/2) and $\text{Ni}_{0.5}\text{Mn}_{1.5}\text{O}_4$ (Li0) evaluated using XRD patterns during potential step charging experiment from fully discharged state to 4.85 V vs. Li/Li^+ .

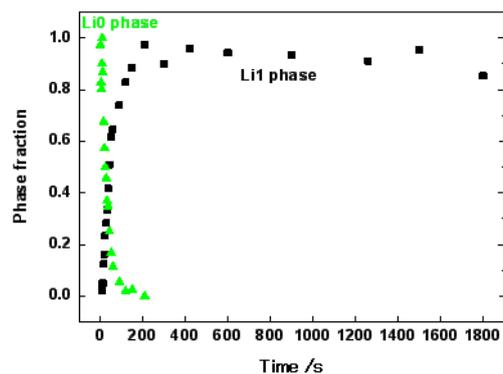


Fig. S9 Phase fractions of $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ (Li1) and $\text{Ni}_{0.5}\text{Mn}_{1.5}\text{O}_4$ (Li0) evaluated using XRD patterns during potential step discharging experiment from fully charged state to 3.50 V vs. Li/Li^+ .