

## Supplementary Information

### Impact of Surface Coating on Electrochemical and Thermal Behaviors of Li-rich $\text{Li}_{1.2}\text{Ni}_{0.16}\text{Mn}_{0.56}\text{Co}_{0.08}\text{O}_2$ Cathode

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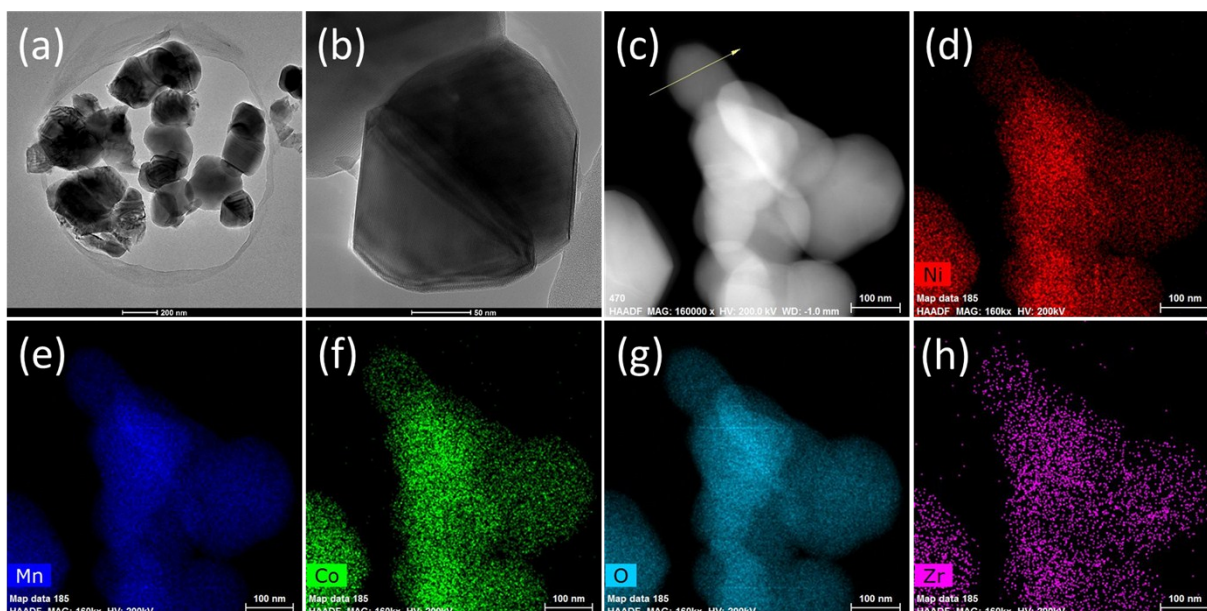


Fig. S-1. TEM and elemental images of 1wt.% ZrO<sub>2</sub> coated Li<sub>1.2</sub>Ni<sub>0.16</sub>Mn<sub>0.56</sub>Co<sub>0.08</sub>O<sub>2</sub> (NMC).

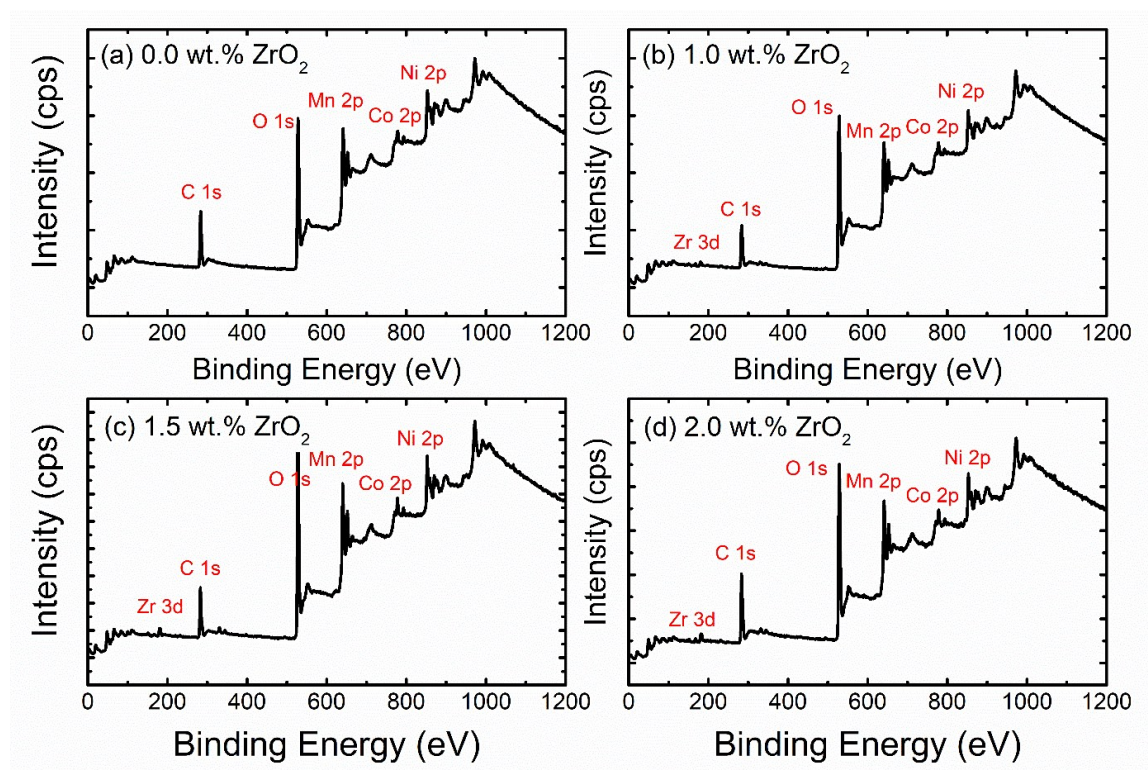


Fig. S-2. XPS survey patterns for (a) pristine and (b-d) ZrO<sub>2</sub> coated Li<sub>1.2</sub>Ni<sub>0.16</sub>Mn<sub>0.56</sub>Co<sub>0.08</sub>O<sub>2</sub> (ZrO<sub>2</sub>=1.0, 1.5 & 2.0 wt.%).

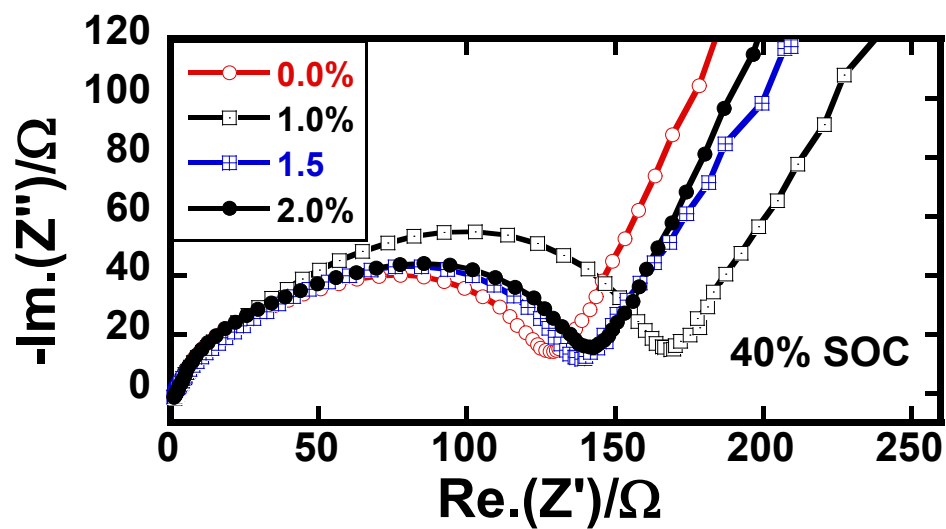


Fig. S-3 Impedance spectra of  $\text{ZrO}_2$  coated  $\text{Li}_{1.2}\text{Ni}_{0.16}\text{Mn}_{0.56}\text{Co}_{0.08}\text{O}_2$  ( $\text{ZrO}_2=0.0\%$ ,  $1.0\%$ ,  $1.5\%$  &  $2.0$  wt.%) at  $40\%$  state of charge.

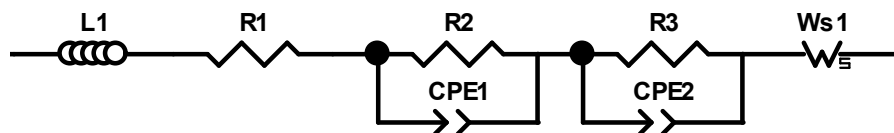


Fig. S-4 Equivalent circuit used to evaluate the differences resistances as a function of state of charged and discharged.