# Supplementary Information

## Eco-compatible Oxides Enabling Energy Storage via $Li^+/Mg^{2+}$ Co-intercalation

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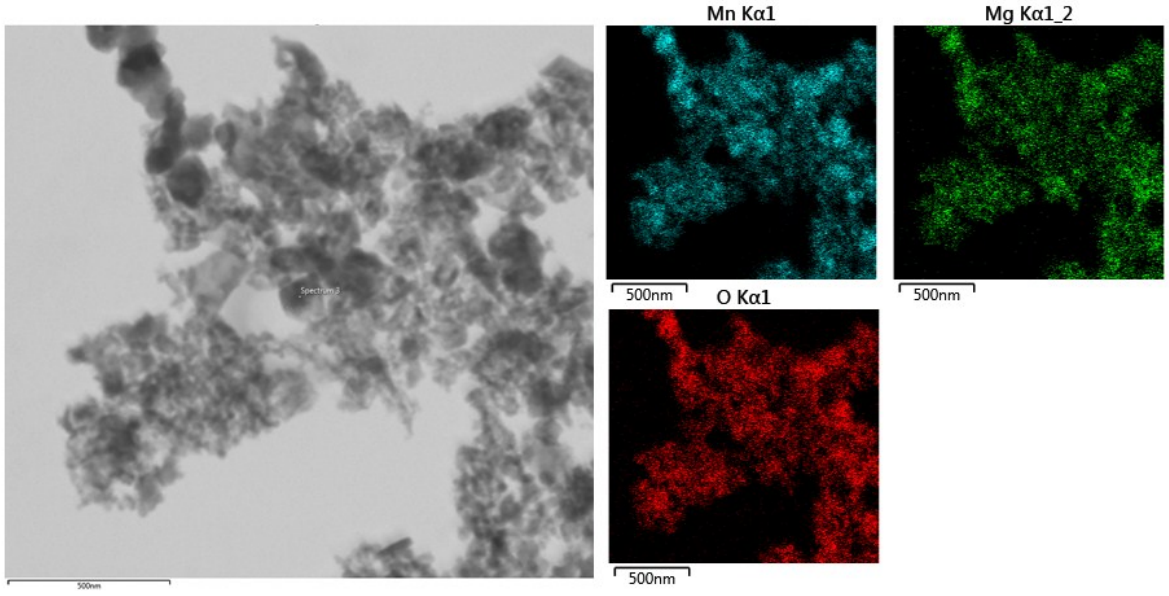
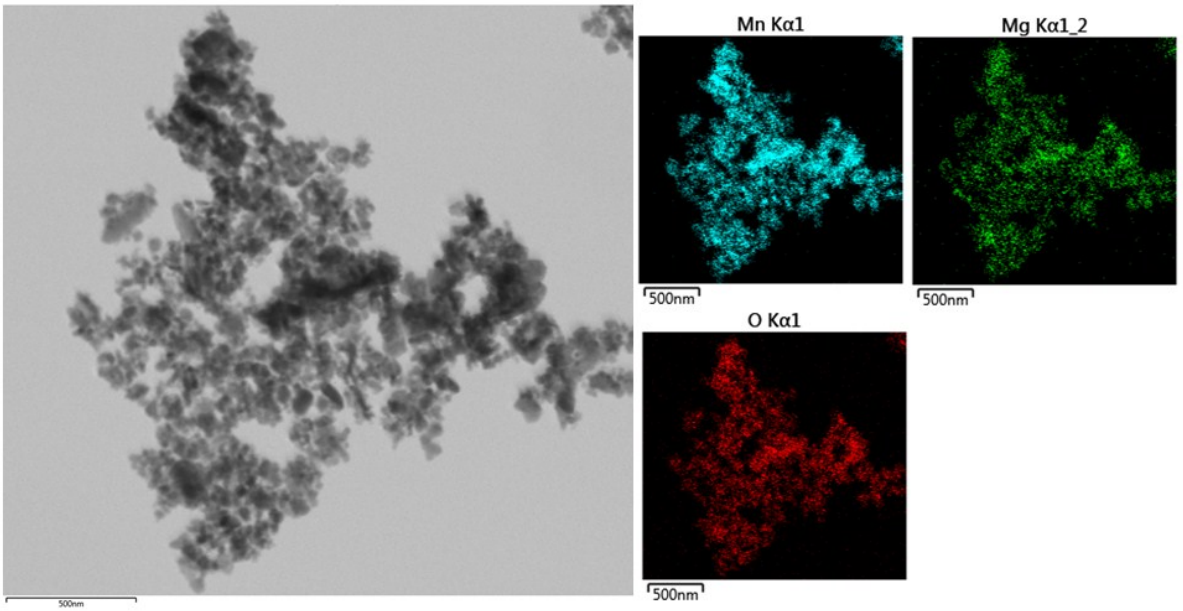
**Figure S1** BF-STEM images and corresponding composition map of Mn Kα1, Mg Kα1 and O Kα1 for $MgMn_2O_4$ spinels annealed at 350 °C (a) and 550 °C (b).

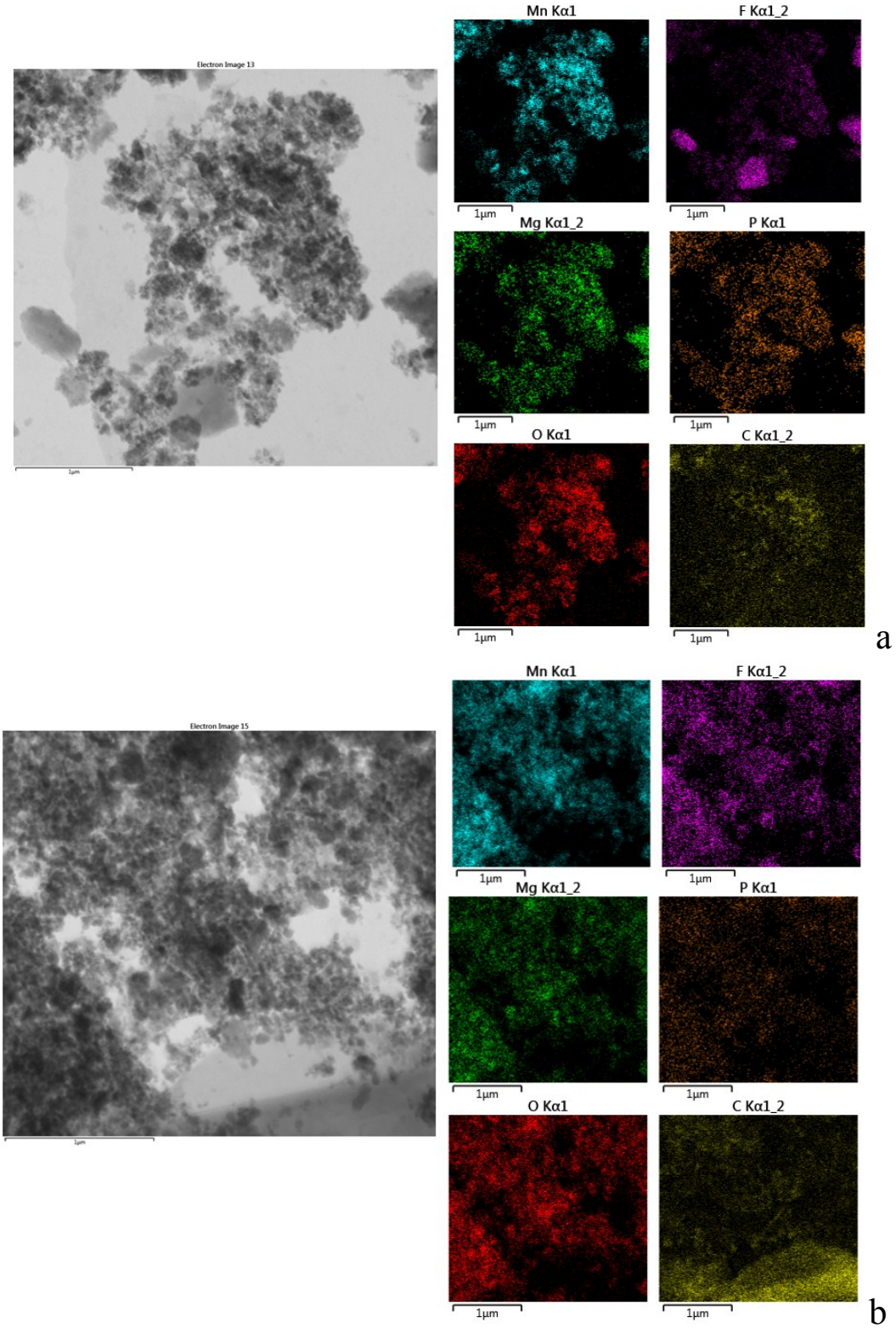


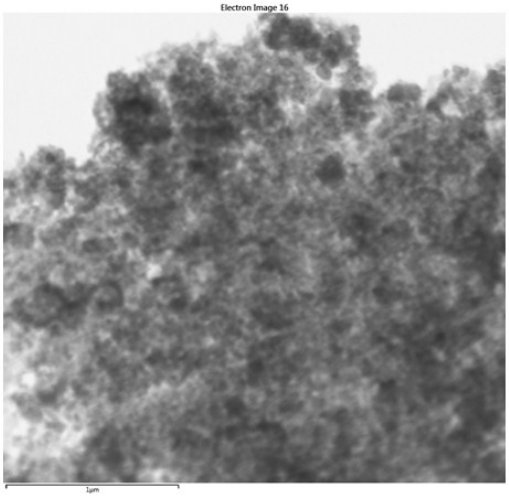

a

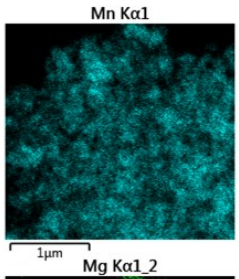


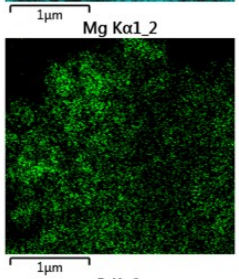

b

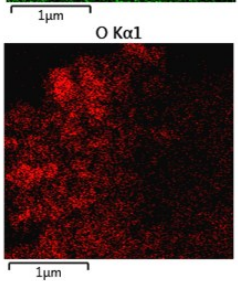
**Figure S2** BF-STEM images and corresponding composition map of Mn Kα1, Mg Kα1 and O Kα1 for $MgMn_2O_4$ electrodes: (a) inverse $MgMn_2O_4$ cycled in lithium electrolyte; (b) normal $MgMn_2O_4$ cycled in lithium electrolyte, and (c) inverse $MgMn_2O_4$ cycled in lithium electrolyte.

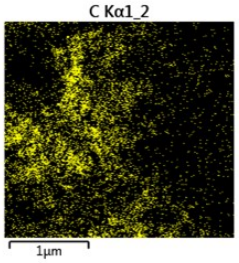



Electron Image 16
1µm


Mn Kα1
1µm


Mg Kα1_2
1µm


O Kα1
1µm


C Kα1_2
1µm

c

**Figure S3** SEM image of monoclinic $Li_2TiO_3$.