

## Supplementary Information

# Cathode Properties of $\text{MgV}_2\text{O}_4$ Spinel for Magnesium Rechargeable Batteries: Effect of Synthesis Route on Structure and Electrochemical Performance

Naoya Ishida<sup>a\*</sup>, Keigo Kubota<sup>a</sup>, Toshikatsu Kojima<sup>a</sup>, Toshihiko Mandai<sup>b</sup>, Shin Kiyohara<sup>c</sup>, Yu Kumagai<sup>c</sup>, Tetsu Ichitsubo<sup>c</sup>

<sup>a</sup> Research Institute of Electrochemical Energy, National Institute of Advanced Industrial Sciences and Technology (AIST), 1-8-31 Midorigaoka, Ikeda, Osaka 563-8577, Japan

<sup>b</sup> Functional Electrolyte Synthesis Team, Research Center for Energy and Environmental Materials (GREEN), National Institute for Materials Science (NIMS), 1-1 Namiki, Tsukuba, Ibaraki, 305-0044 Japan

<sup>c</sup> Institute for Materials Research (IMR), Tohoku University, 2-1-1 Katahira, Aoba-ku, Sendai, 980-8577 Japan

Tel: +81-50-3522-6828

\*E-mail: [naoya-ishida@aist.go.jp](mailto:naoya-ishida@aist.go.jp) (corresponding author)

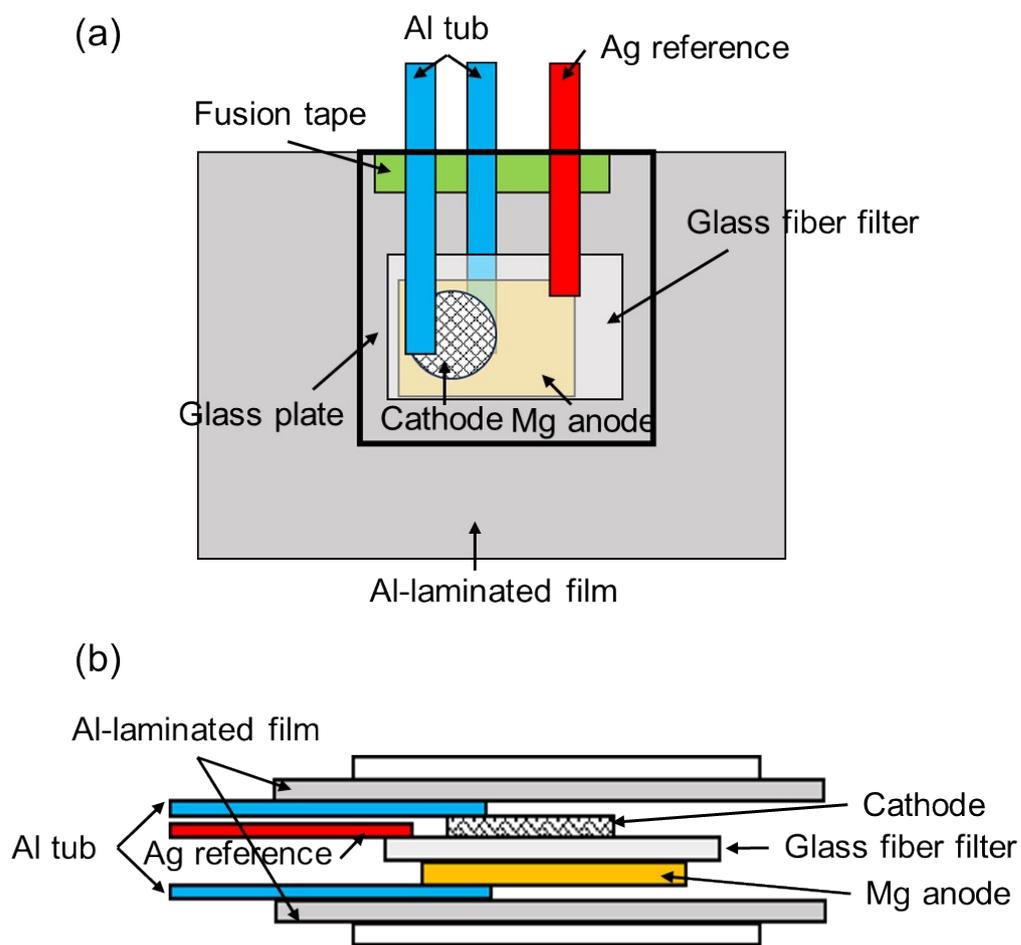


Fig. S1 (a) Schematic diagram of a laminated three-electrode cell and (b) its cross section.

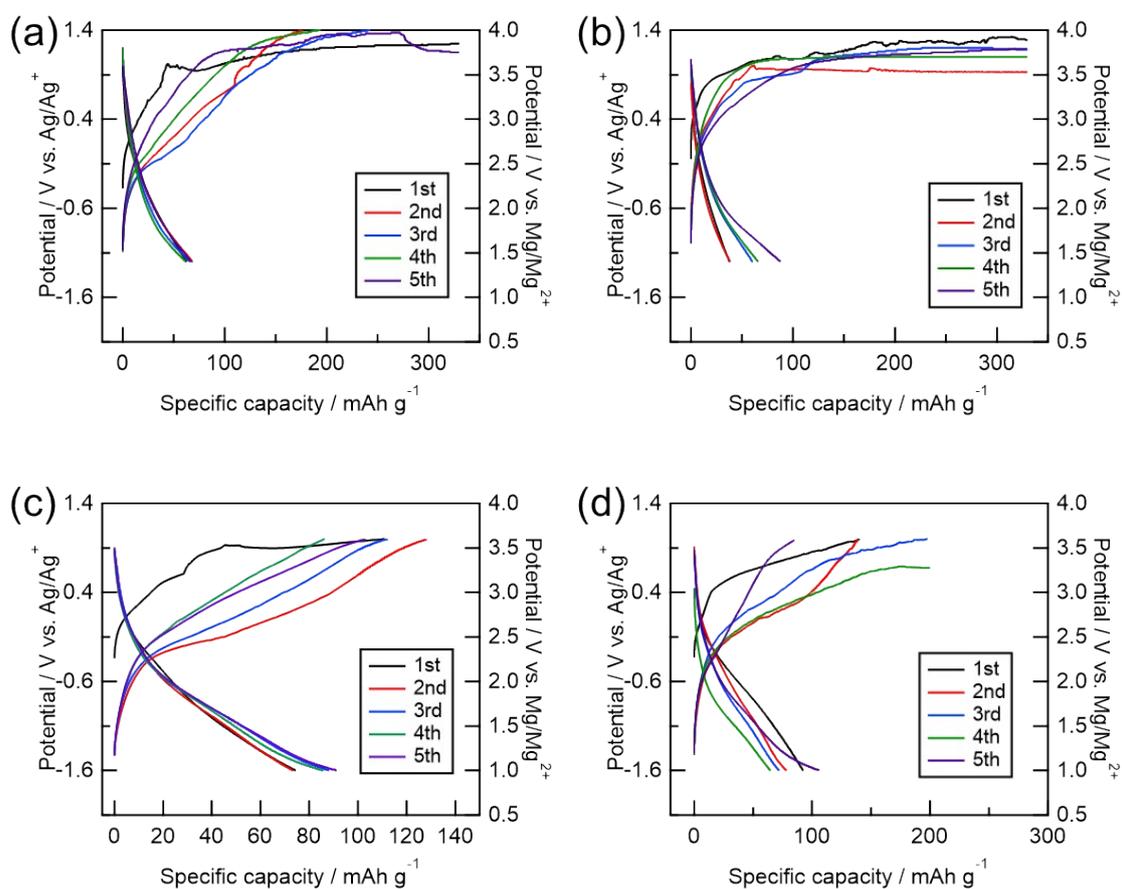


Fig. S2 Charge/discharge curves showing all charge curves in Fig. 3: (a) pristine  $\text{MgV}_2\text{O}_4$  calcined at  $750\text{ }^\circ\text{C}$ , (b) 64 h mechanically milled with  $\phi 5\text{ mm ZrO}_2$ , (c) +16 h with  $\phi 0.2\text{ mm ZrO}_2$ , and (d) +2 h with  $\phi 0.1\text{ mm ZrO}_2$ , resulting in 82 h in total.

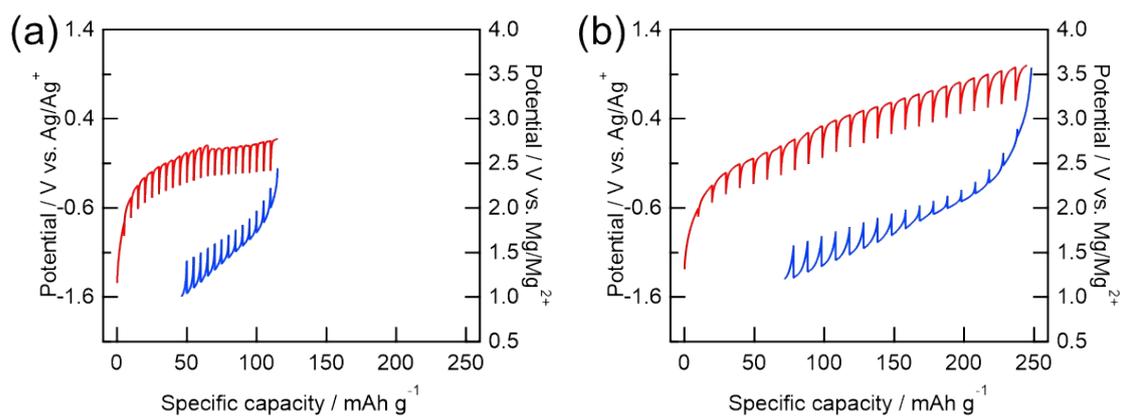


Fig. S3 GITT curves of (a) MM-MVO (total 82 h) and (b) ST-MVO measured after initial cycle.

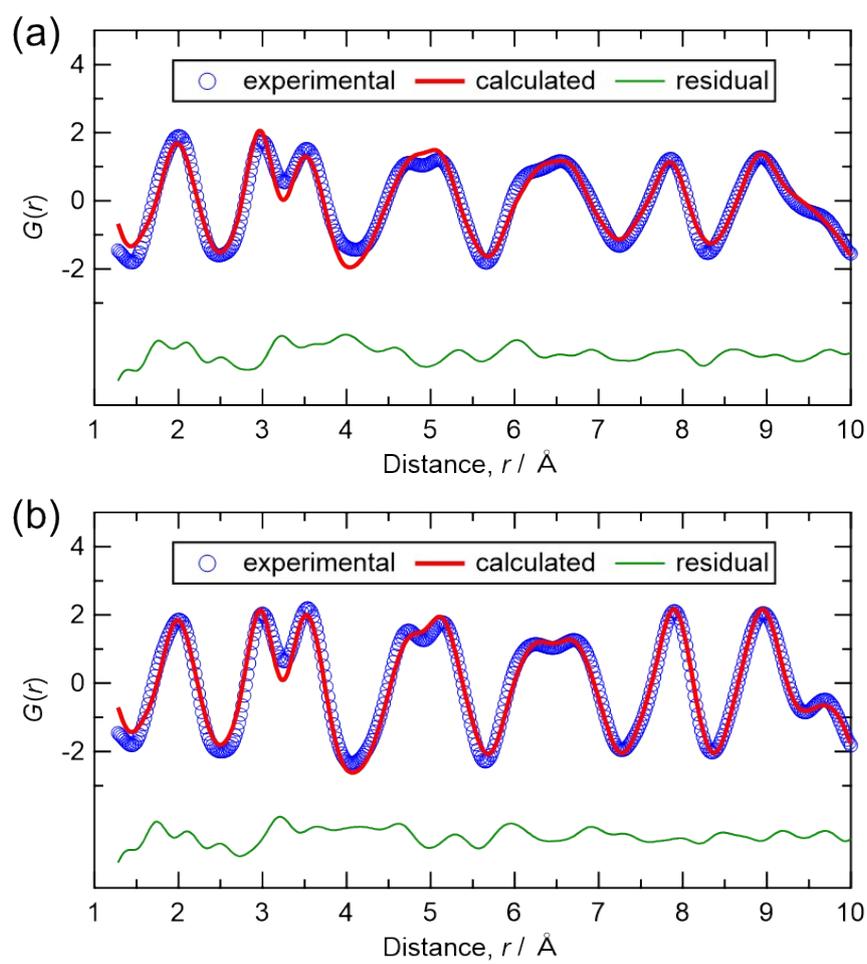


Fig. S4 Fitting of the reduced pair distribution function,  $G(r)$ , based on X-ray total scattering data collected using SmarLab XRD equipment with Mo  $K\alpha$  radiation: (a) MM-MVO and (b) ST-MVO.