## Electronic Supplementary Information

# Preparation of graphene-encapsulated mesoporous metal oxides and their application as anode materials for lithium-ion batteries

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## EXPERIMENTAL SECTION

The normal SBA-15, KIT-6 and SBA-16 were synthesized according to the published literature.[1] The KIT-6 with small particle size was synthesised by reducing the concentrations of P123 and TEOS to 1/2 in the solution and shortening the aging time to 24 h, denoted as KIT-6S. Mesoporous $Co_3O_4$, $Cr_2O_3$ and NiO were fabricated by introducing 1.5 mmol of cobalt nitrate, chromium nitrate and nickel nitrate into 0.15 g of KIT-6, SBA-15 and SBA-16, respectively, allowing it to decompose and crystallize into $Co_3O_4$, $Cr_2O_3$ and NiO at 500 °C for 4 h. The silica templates were removed in a 10 wt% HF solution at room temperature or 2 M NaOH solution at 80 °C for 2 h. Mesoporous $Co_3O_4$, $Cr_2O_3$ and NiO powders were collected by centrifugation, washed with distilled water thrice, and dried at 40 °C. Mesoporous $Co_3O_4$ with small particle size was also synthesized by using KIT-6S as a template.

5 g of graphite powder (average size 2 μm, apparent density 0.05 g $cm^{-3}$) and 5 g of $NaNO_3$ were added into 230 mL of 98% $H_2SO_4$ under stirring in an ice bath. 30 g of $KMnO_4$ was slowly added to the mixture under stirring for 15 min at below 5 °C. The mixture was then heated at 35°C for 30 min. Subsequently, 460 ml of distilled water was slowly introduced into the above mixture, followed by stirring the mixture at 98 °C for more than 15 min. The mixture was further diluted with 1400 mL of distilled water and the reaction was terminated by adding 25 mL of 30 % $H_2O_2$. Meanwhile, the color of the solution turned from dark brown to bright yellow. The resulting mixture was filtered and washed with 100mL distilled water thrice to remove residual acids and salts. As-prepared GO was dispersed in water by ultrasonication for 30 min, followed by a low-speed centrifugation to get rid of any aggregated GO nanosheets.

1. (a) D. Y. Zhao, J. L. Feng, Q. S. Huo, N. Melosh, G. H. Fredrickson, B. F. Chmelka and G. D. Stucky, *Science*, 1998, **279**, 548; (b) F. Kleitz, S. H. Choi and R. Ryoo, *Chem. Commun.*, 2003, 2136; (c) D. Y. Zhao, Q. S. Huo, J. L. Feng, B. F. Chmelka and G. D. Stucky, *J. Am. Chem. Soc.*, 1998, **120**, 6024.

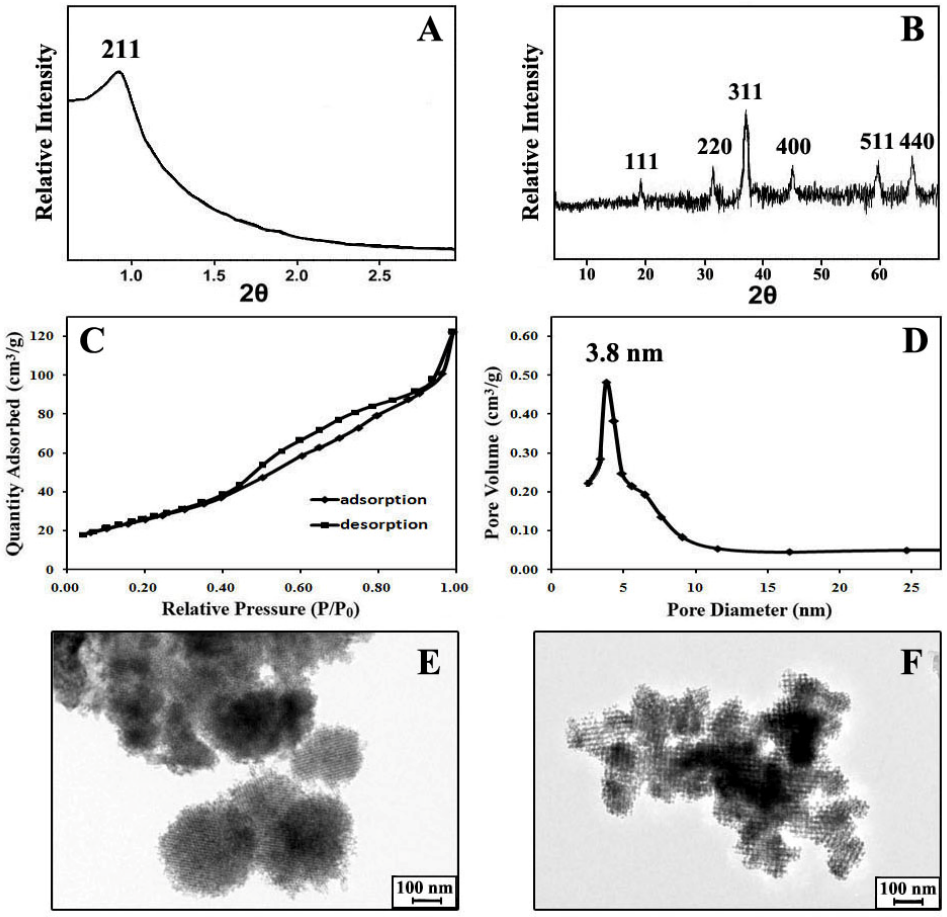


**Fig. S1** XRD patterns of M-$Co_3O_4$ templated by KIT-6 in small-angle (A) and wide-angle (B); $N_2$ adsorption/desorption isotherms measured at 77 K from M-$Co_3O_4$ (C) and the corresponding pore size distribution (D); TEM images of M-$Co_3O_4$ specimens with large particle size (E) and small particle size (F).

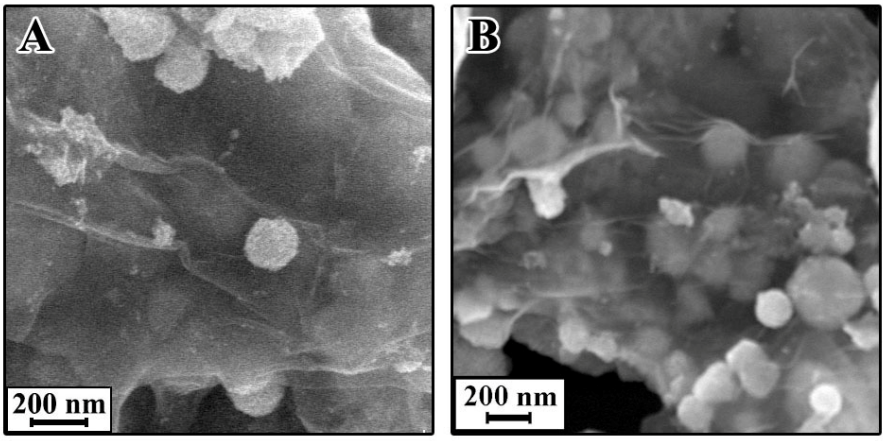


**Fig. S2** SEM images of MG-$Co_3O_4$-5 (A) and MG-$Co_3O_4$S-5 (B), respectively.

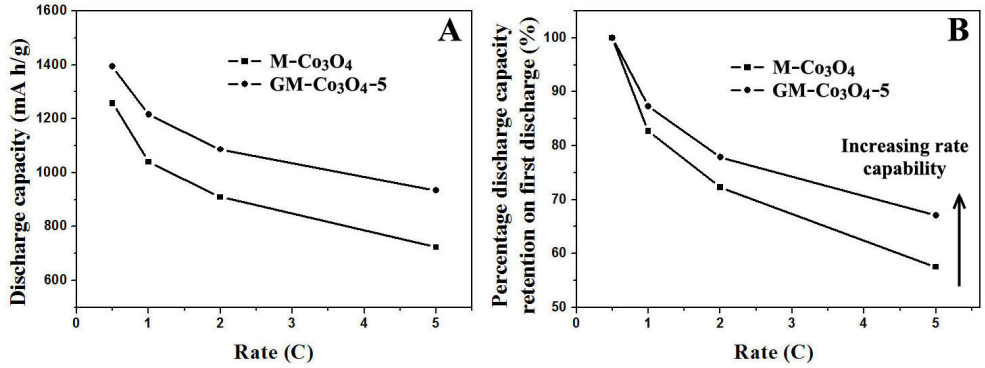


**Fig. S3** A, first discharge capacities for M-$Co_3O_4$ and GM-$Co_3O_4$-5 specimens as a function of rate; B, percentage capacity retention for these two specimens as a function of rate.