Electronic Supplementary Information

Synthesis of NASICON-type structured $NaTi_2(PO_4)_3$-graphene nanocomposites as anodes for aqueous rechargeable Na-ion batteries

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Synthesis of Graphite oxide (GO)

Graphite oxide (GO) was prepared by a modified Hummers method (ref.30 in main text). The graphite powder (12 g) was added slowly into an 90 ºC solution of concentrated H_2SO_4 (50 mL), $K_2S_2O_8$ (10 g), and P_2O_5 (10 g). While maintaining agitation at 80ºC for 4.5 h, the resultant dark blue mixture was allowed to cool to room temperature. The mixture was then carefully diluted with distilled water, filtered until the rinse water pH became neutral. The product was dried in air at 80 ºC for 12 h. This preoxidized graphite was then subjected to oxidation by Hummers' method.

The oxidized graphite powder (6 g) was put into concentrated H_2SO_4 (230 mL) in an ice-bath and stirred for 30 min. $KMnO_4$ (30 g) was added gradually to the suspension with stirring and cooling. The rate of addition was controlled carefully to prevent the temperature of the suspension from exceeding 20 ºC as a safety measure. Then, the mixture was slowly heated to 35 ºC and stirred for 2 h. Subsequently, distilled water (460 ml) was dropwise added under vigorous stirring, causing violent effervescence and a quick rise in temperature to near 100 ºC. The slurry was stirred at the temperature for another 30 min. Afterwards, 30 % H_2O_2 solution (50 ml) and distilled water (800 ml) were added sequentially to reduce insoluble manganese species and stirred for 12 h. The resulting bright yellow suspension was filtrated and washed using 2000 ml dilute HCl (1 mol/L) solution. After dispersing the collected precipitate into 2000 ml distilled water, the solution was centrifuged and washed twice with distilled water. Subsequently, the resulting product was dried under vacuum at 80 ºC for two days. The GO was obtained and ground into powder (100 mesh).

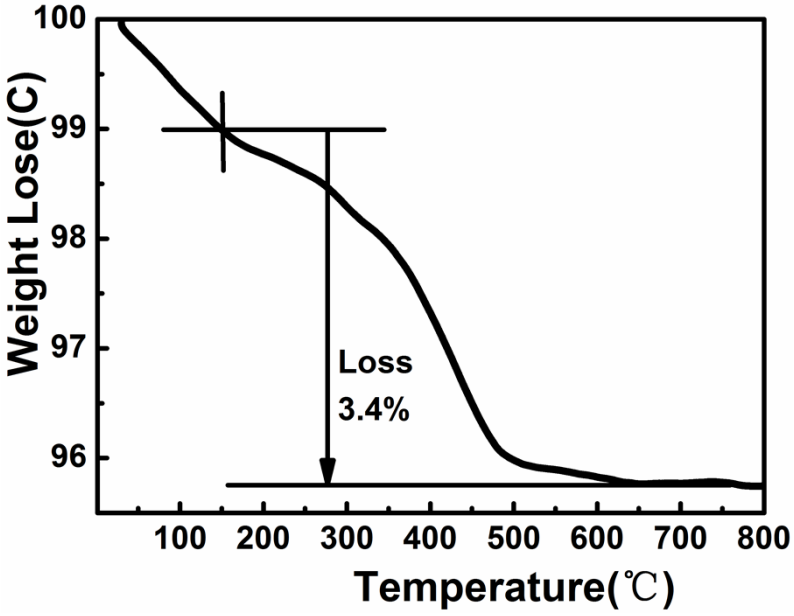

Fig. S1 TG curve of the $NaTi_2(PO_4)_3$/GNS in air atmosphere.

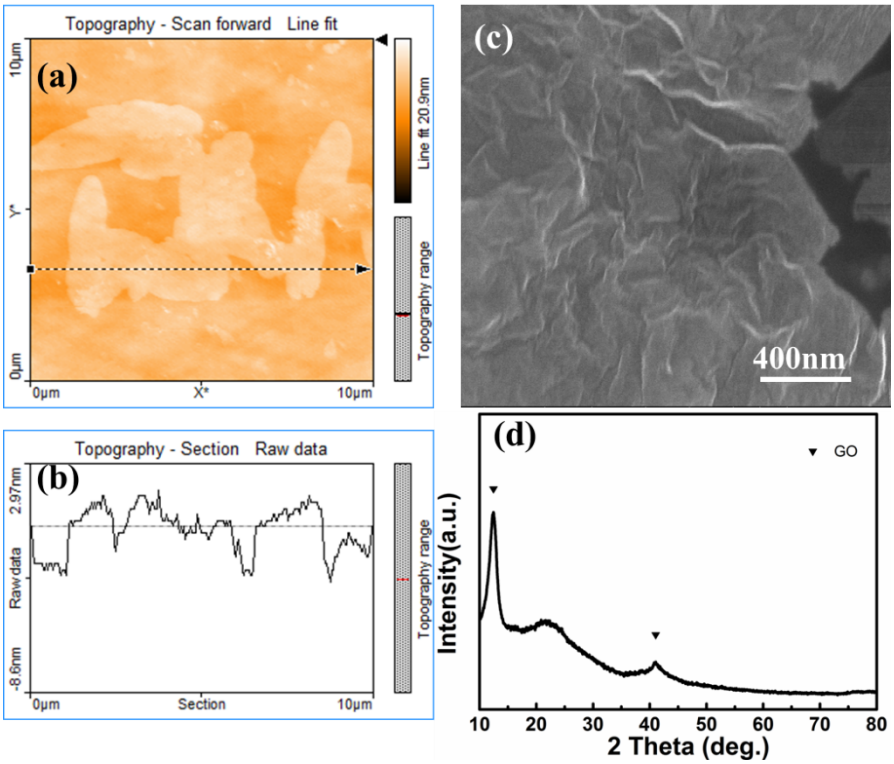

Fig. S2 AFM image and the thickness (a, b), FESEM image (c) and XRD pattern (d) of GO.

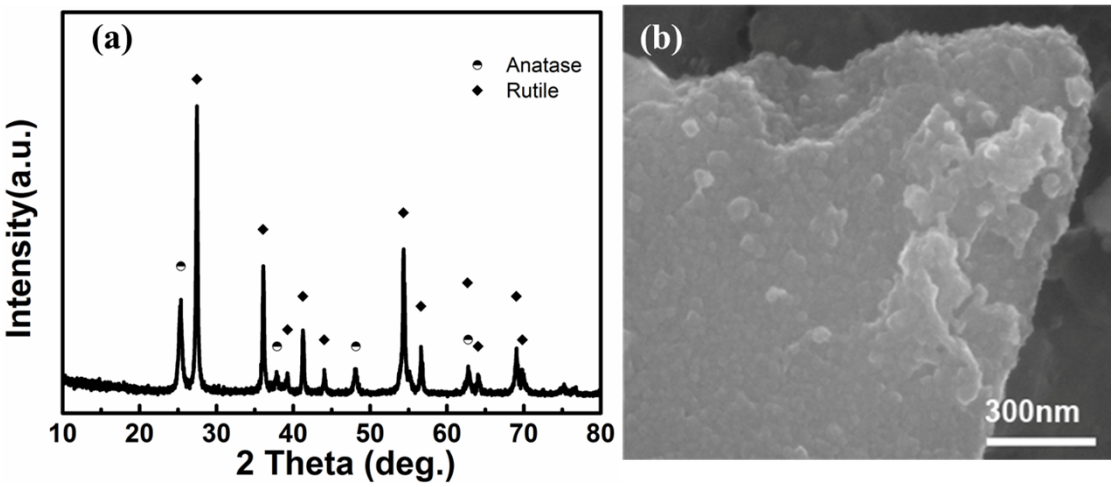

Fig. S3 XRD pattern (a) and FESEM image (b) of TiO_2/GNS.

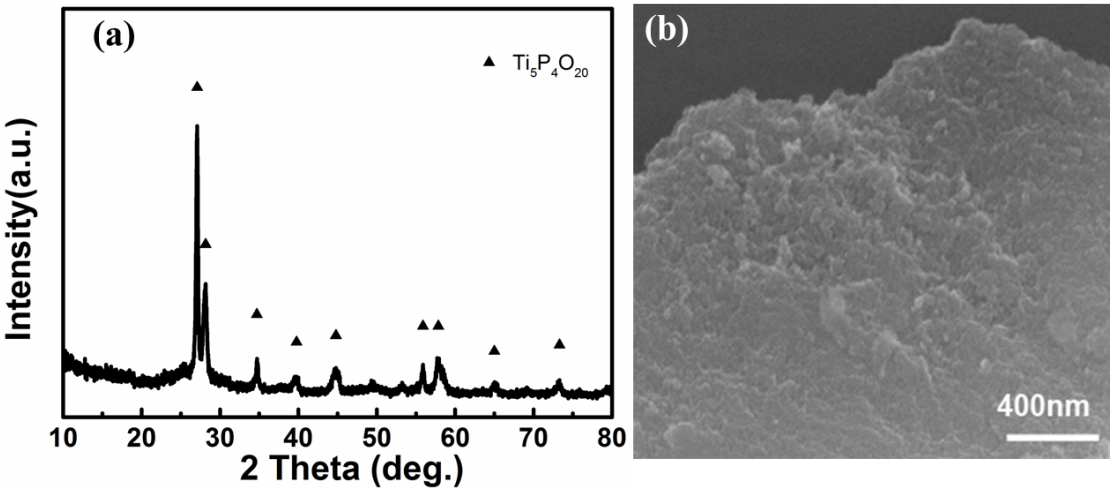

Fig. S4 XRD pattern (a) and FESEM image (b) of $Ti_5P_4O_{20}$/GNS.

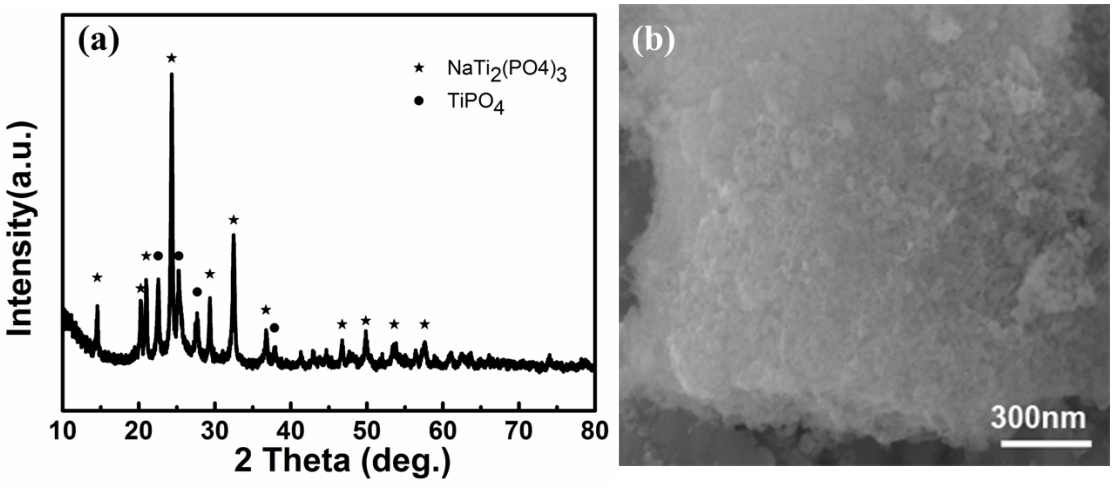

Fig. S5 XRD pattern (a) and FESEM image (b) of $NaTi_2(PO_4)_3$/GNS.