Enhanced electrochemical performance of vanadium dioxide (B) nanoflowers by graphene nanoribbons support

Supplementary materials

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A. Reductant

VO_2 crystallites were synthesized by hydrothermal method at 180 ℃ for 24 h by using oxalic acid or hydrazine hydrate to reduce vanadium pentoxide. By comparing XRD patterns of the products (see figure S1), it shows that the diffraction peaks of product which was prepared by using oxalic acid reductant are all match with single VO_2(B) phase (JCPDS Card No. 81-2392) when the reaction time reach at least 24 h and the mole ratio of $H_2C_2O_4$:V_2O_5 is 2:1. While the as-prepared product includes varied vanadium oxide phases when the hydrazine hydrate is used as the reductant. The possible cause is that it is difficult to accurately control the dosage of hydrazine hydrate to prepare single VO_2 phase due to the stronger reducibility of hydrazine hydrate. So it is appropriate to choose oxalic acid reductant to prepare VO_2(B).

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Electronic supplementary information (ESI) available: Synthesis details and theoretical calculation details.

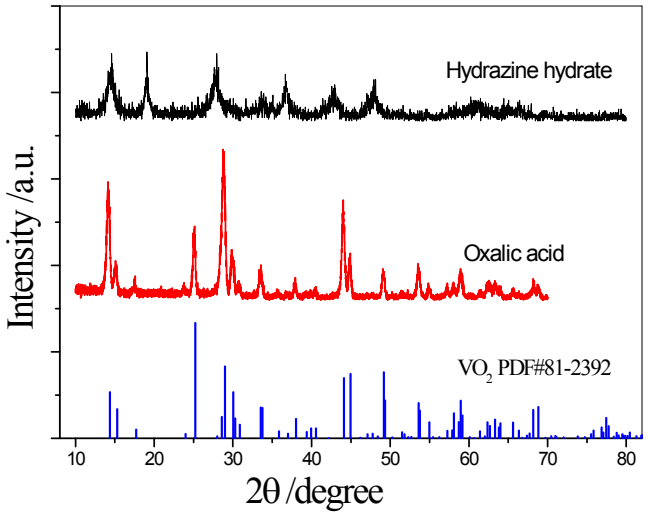

Fig. S1 XRD patterns of VO_2 crystallites synthesized by using oxalic acid or hydrazine hydratere as reductants.

B. Reaction time

The impacts of reaction time on the crystal phase of products were discussed to further optimize reaction time. XRD patterns of vanadium oxide prepared in the different reaction time by using oxalic acid as reductant are shown in figure S2. It exhibits that the single VO_2 phase can be obtained until the reaction time reaches 24 hours.

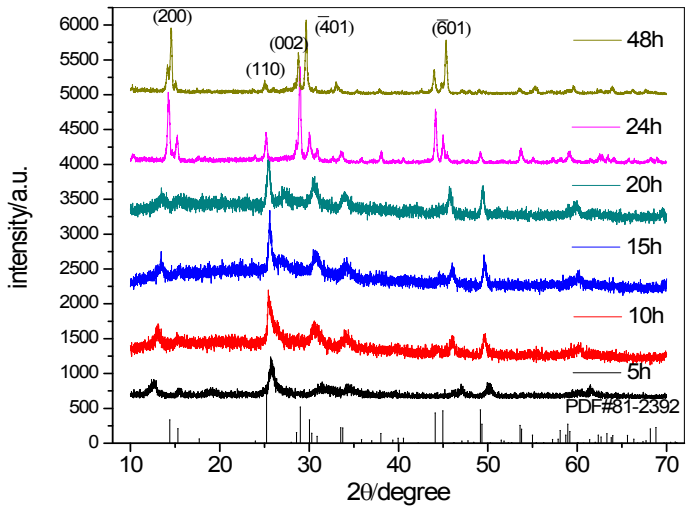

Fig. S2 XRD patterns of vanadium oxide prepared in the different reaction time.

C. Potential-time curve

The charge-discharge potential-time curve of VO_2(B)/GNRs is shown in Fig. S3). It

indicates that the charge-discharge potential-time curve of VO_2(B)/GNRs has a symmetry characteristic and a stable charge-discharge time.

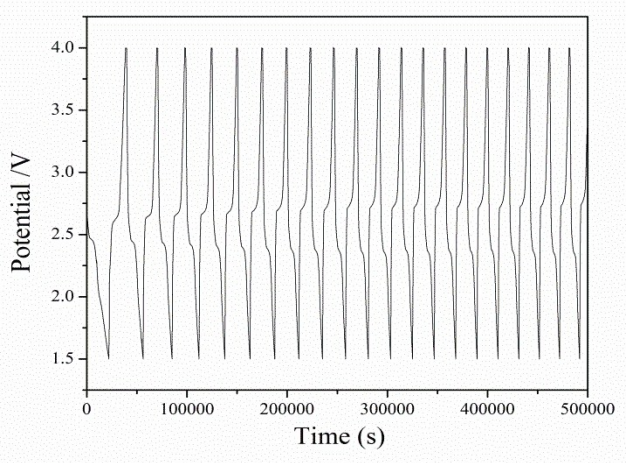

Fig. S3 Potential-time curve of VO_2(B)/GNRs during the charge and discharge process.