Electrochemically Induced Phase Transition in $V_3O_7 \cdot H_2O$ Nanobelts/Reduced Graphene Oxide Composites for Aqueous Zinc-Ion Batteries

Huili Cao[a*], Zhiyong Zheng[a], Poul Norby[b], Xinxin Xiao[a] and Susanne Mossin[a]

[a]DenmarkaDepartment of Chemistry, Technical University of Denmark, 2800 Kgs. Lyngby, Denmark

[b]*Department of Energy Conversion and Storage, Technical University of Denmark, 4000 Roskilde, Denmark. (* E-mail: hucao@kemi.dtu.dk)*

Rechargeable multivalent ion batteries have attracted significant technical and scientific interests, especially aqueous zinc ion batteries, due to their low cost and high safety.[1] Layered $V_3O_7 \cdot H_2O$ is a promising material due to easy intercalation of doubly charged Zn^{2+} ions. This is due to the special structure with extended hydrogen bonding between VO_6 octahedrons and VO^5 trigonal bipyramids.[2] In addition, the mixed oxidation state of vanadium (IV and V) can help improving the electric conductivity. With the addition of reduced graphene oxide, rGO, the active materials obtain high electrochemical stability. Herein, we have synthesized $V_3O_7 \cdot H_2O$ nanowires/reduced graphene oxide composite by a microwave method through controlling pH by a nonoxidizing acid and have thoroughly investigated the reaction mechanisms of the synthesis. A composite used as cathode of the zinc-ion battery can deliver a high specific capacity of 385.7 mAh g^{-1} at a current density of 4 A g^{-1}. Impressively, the capacity retention after 1000 cycle is up to 96%. This excellent performance suggests that vanadium oxide and rGO composite may be a good cathode candidate for aqueous zinc ion battery.

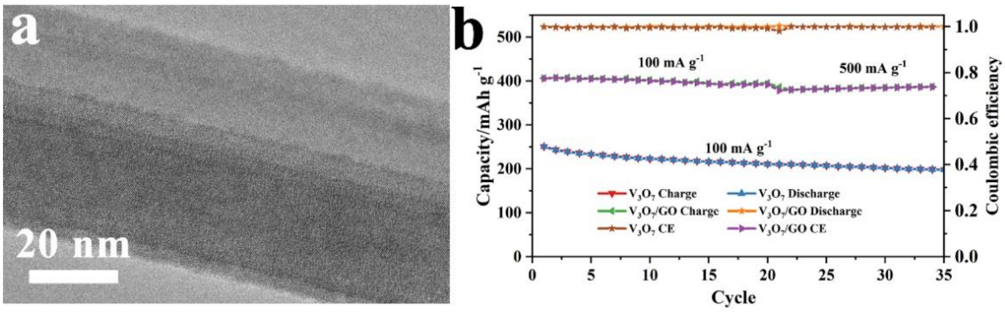

Figure 1 TEM image of the $V_3O_7 \cdot H_2O$ nanowire (a) and cycling performance of the pure $V_3O_7 \cdot H_2O$ nanowire and $V_3O_7 \cdot H_2O$ nanowires/reduced graphene oxide composite (b).

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Reference

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