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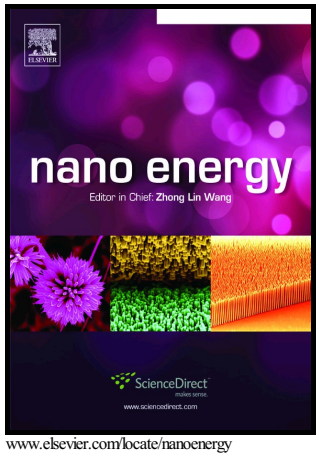

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Potassium vanadates with stable structure and fast ion diffusion channel as cathode for rechargeable aqueous zinc-ion batteries

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Abstract

Rechargeable aqueous zinc ion batteries (ZIBs) are feasible for grid-scale applications due to their unique attributes such as safe, sustainable, and low-cost. However, it is limited by cathode materials, which requires a stable host structure and fast channel for zinc ions diffusion. Here, we develop various kinds of potassium vanadates ($K_2V_8O_{21}$, $K_{0.25}V_2O_5$, $K_2V_6O_{16}\cdot 1.57H_2O$ and KV_3O_8) as cathodes for aqueous ZIBs. $K_2V_8O_{21}$ and $K_{0.25}V_2O_5$ with tunnel structure can maintain a stable structure and are conducive to the faster zinc ion diffusion during repeated cycles compared to the layered KV_3O_8 and $K_2V_6O_{16}\cdot 1.57H_2O$ that suffer from structural collapse. The optimal $K_2V_8O_{21}$ cathode exhibits excellent zinc storage performance, with a high capacity of 247 mA h g^{-1} at 0.3 A g^{-1} and a good rate at 6 A g^{-1} as well as excellent cyclic stability up to 300 cycles. The results suggest $K_2V_8O_{21}$ is a very promising cathode for aqueous ZIBs, which could be extended to

[1] These authors contributed equally to this work.