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| Title | Pyrosynthesis of Na3V2(PO4)3@C Cathodes for Safe and Low‐Cost Aqueous Hybrid Batteries. | | |
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| Abstract |  |
| Rechargeable hybrid aqueous batteries (ReHABs) have emerged as promising sustainable energy-storage devices because all components are environmentally benign and abundant. In this study, a carbon-wrapped sponge-like Na3V2(PO4)3 nanoparticle (NVP@C) cathode is prepared by a simple pyrosynthesis for use in the ReHAB system with impressive rate capability and high cyclability. A high-resolution X-ray diffraction study confirmed the formation of pure Na ion superionic conductor (NASICON) NVP with rhombohedral structure. When tested in the ReHAB system, the NVP@C demonstrated high rate capability (66 mAh g−1 at 32 C) and remarkable cyclability over 1000 cycles (about 72 % of the initial capacity is retained at 30 C). Structural transformation and oxidation change studies of the electrode evaluated by using in situ synchrotron X-ray diffraction and ex situ X-ray photoelectron spectroscopy, respectively, confirmed the high reversibility of the NVP@C electrode in the ReHAB system through a two-phase reaction. The combined strategy of nanosizing and carbon-wrapping in the NVP particles is responsible for the remarkable electrochemical properties. The pyrosynthesis technique appears to be a promising and feasible approach to prepare a high-performance electrode for safe and low-cost ReHAB systems as nextgeneration large-scale energy storage devices. | |