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Comparative electrochemical studies of a nanostructured vanadium oxide electrode material in aqueous electrolyte[1] VICTORIA SOGHOMONIAN, QIFAN YUAN, SHAOLA REN, JULIA ZUKOWSKI , Virginia Tech, Department of Physics — Electrochemical energy storage plays an increasing role in energy solutions. We report on a new hydrothermally synthesized vanadium oxide nanostructured material and study its performance as electrode material for insertion of various ions from aqueous solutions. The as-synthesized product is in the form of nanosheets forming quasi-spherical 3-dimensional objects. Variable temperature resistivity measurements indicate a thermally activated behavior. Electrodes are constructed, and comparative electrochemical insertion reactions of Li, Na, K and NH4 cations, over different cycle numbers, investigated. Concomitantly, morphological and microstructural changes are characterized by scanning electron microscopy, providing physical input to the observed electrochemical behavior. Specific charge is calculated. For Li and K, the specific charge decreases as the cycle number increases, while the reverse is observed for Na and NH4 cations. The trends are correlated to the morphological changes observed. The specific charge in the case of ammonium reaches 180 mAh/g after 20 cycles and continues increasing, indicating that ammonium cations may be considered as viable charge carriers for electrical energy storage system, and moreover in an aqueous electrolyte.

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