Reduced surfactant uptake in three dimensional assemblies of VOx Nanotubes Improves Reversible Li+ intercalation and charge capacity

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The relationship between the nanoscale structure of vanadium pentoxide nanotubes and their ability to accommodate Li+ during intercalation/ deintercalation is explored. The nanotubes are synthesized using two different precursors through a surfactant-assisted templating method, resulting in standalone VOx (vanadium oxide) nanotubes and also "nanourchin". Under highly reducing conditions, where the interlaminar uptake of primary alkylamines is maximized, standalone nanotubes exhibit near-perfect scrolled layers and long-range structural order even at the molecular level. Under less reducing conditions, the degree of amine uptake is reduced due to a lower density of V4+ sites and less V2O5 is functionalized with adsorbed alkylammonium cations. This is typical of the nano-urchin structure. Highresolution TEM studies revealed the unique observation of nanometer-scale nanocrystals of pristine unreacted V 2O5 throughout the length of the nanotubes in the nano-urchin. Electrochemical intercal