Layered sodium titanate nanostructures as a new electrode for high energy density supercapacitors

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\textbf{A B S T R A C T}

A flower-shaped hydrated layered sodium titanate material, Na\textsubscript{2}Ti\textsubscript{2}O\textsubscript{4}(OH)\textsubscript{2}, have been synthesized through a facile hydrothermal method and subsequently converted into sodium free titania (anatase). Potential application of the Na\textsubscript{2}Ti\textsubscript{2}O\textsubscript{4}(OH)\textsubscript{2} as an electrode for supercapacitors under pseudo-capacitance storage mode is evaluated. The Na\textsubscript{2}Ti\textsubscript{2}O\textsubscript{4}(OH)\textsubscript{2} showed sixfold higher specific capacitance (\(C\textsubscript{s} \sim 300 \text{ F g}^{-1}\)) in an aqueous electrolyte than the anatase and demonstrated stable electrochemical cycling. This high \(C\textsubscript{s}\) is originated from a combination of electrochemical double layer and pseudo-capacitance storage mechanisms. The presence of hydrated layered within some loose interlayer plays an important role in assisting the diffusion process of ions as confirmed in electrical impedance spectroscopy analysis.

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