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# Preparation of highly capacitive polyaniline/black TiO<sub>2</sub> nanotubes as supercapacitor electrode by hydrogenation and electrochemical deposition

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## Highlights

- PANI/H-TiO<sub>2</sub> NTs is prepared by hydrogenation and electrochemical deposition.
- PANI/H-TiO<sub>2</sub> NTs exhibits higher capacitance than PANI/TiO<sub>2</sub> NTs.
- PANI/H-TiO<sub>2</sub> NTs achieves the highest capacitance value of 999 F·g<sup>-1</sup> based on TiO<sub>2</sub> NTs.
- PANI/H-TiO<sub>2</sub> NTs has remarkable cycling stability and great rate capability.

**Abstract:** A combination method of hydrogenated reduction and electrochemical deposition is employed to prepare highly capacitive polyaniline/black TiO<sub>2</sub> nanotubes (PANI/H-TiO<sub>2</sub> NTs) for supercapacitor. PANI/H-TiO<sub>2</sub> NTs shows capacitance of 999 F g<sup>-1</sup> at the current density of 0.6 A g<sup>-1</sup>. To the best of our knowledge, this result is the highest value based on TiO<sub>2</sub> nanotubes (TiO<sub>2</sub> NTs) or its composites (PANI/TiO<sub>2</sub> NTs) for supercapacitor electrode. Moreover, PANI/H-TiO<sub>2</sub> NTs also shows remarkable long-term cycling stability with only 29.8 % reduction of the initial capacitance at a current density of 24.0 A g<sup>-1</sup> after 2000 charge-discharge cycles, as well as great rate capability. The electrochemical impedance spectroscopy of PANI/H-TiO<sub>2</sub> NTs shows that this electrode has low resistance. The solution resistance and charge-transfer resistance is as low as 0.1554 and 2.723 Ω

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