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## Titanium Oxynitride Thin Film and Nanowires for Ultrahigh Capacitance Supercapacitors

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High-quality, multifunctional two-dimensional (2D) titanium oxynitride (TiNO) thin films and one-dimensional (1D) TiNO nanowires have been synthesized using a pulsed laser deposition, a simple, fast, and congruent evaporation method. First-principles calculations as a function of surface orientation and termination indicate that surface oxidation of TiNO nanowires can stabilize the (110) orientation observed experimentally. The specific capacitance value for the TiNO nanowire samples (2725 mF/cm<sup>2</sup>) has been found to be nearly six times more than that of the TiNO thin film samples (400 mF/cm<sup>2</sup>), which is attributed to the high packing density of TiNO nanowires over a given area. The nanowire samples have also been found to exhibit a significantly higher energy density (1.35 μWh/cm<sup>2</sup>) than the TiNO thin-film samples (0.33 μWh/cm<sup>2</sup>). Thus, the TiNO material system in thin-film and nanowire forms has been demonstrated to be a promising candidate for use as an electrode material in supercapacitors and other charge-storage applications.

### Academic or Professional Status

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