Synthesis of Ammonium Titanate Nanostructured Materials via a Surfactant-free Hydrothermal Route

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Nitrogen-substituted ammonium titanate nanostructured materials $(NH_4)_2Ti_3O_{7-x}N_x$ were firstly synthesized by the new method proposed here from titanium oxysulfate precursor in the presence of an ammonia solution under hydrothermal conditions without any extra templates as structure driving agents. The material synthesized with ammonia showed curled nanosheets, nanofibers or fagot-like nanorods morphologies depending on the molar ratio of ammonia to titanium precursor and the hydrothermal temperature. The nanofibrous titanates had a high surface area over 500 $m^2\ g^{-1}$, a pore volume of 0.72 $cm^3\ g^{-1}$ and a uniform pore of ca. 3.9 nm. The calcination of as-synthesized material at 673 K produced a titanium oxynitride $TiO_{2-x}N_x$ with anatase phase, which absorbed visible light. Ion exchange of ammonium ion of the titanate with sodium $Na_2Ti_3O_{7-x}N_x$ enhanced the thermal stability of the titanate phase.