Formation and Stability of NH₄TiOF₃ Mesocrystals
by Liu Yanqiong

Abstract

An investigation is conducted into the formation and anisotropic dissolution of NH₄TiOF₃ mesocrystals, which are shown to partially convert to anatase TiO₂ in an aqueous environment. Growth and dissolution are two competing processes when NH₄TiOF₃ mesocrystals are being formed in the aqueous solution. The parameters affecting the formation of NH₄TiOF₃ mesocrystals studied include temperature, solution pH, presence of surfactant, and hydrophobicity of the hydrophobic tails of the surfactant molecules. Raising temperature and increasing solution pH hinders the formation. Surfactant molecules (Brij 58) appear to facilitate the mesoscale assembly of NH₄TiOF₃ nanocrystals into NH₄TiOF₃ mesocrystals via the interaction of their hydrophobic tails. Lower hydrophobicity of these hydrophobic tails may render failure of this mesoscale assembly process as shown by replacement of Brij 58 (C₁₈EO₂₀) by F127 (EO₁₀₆-PO₇₀-EO₁₀₆). Ferroelectricity of NH₄TiOF₃ mesocrystals is further investigated by both computational study and experimental confirmation. The spontaneous dipole-dipole interaction can also contribute to the mesoscale assembly of NH₄TiOF₃ nanocrystals into NH₄TiOF₃ mesocrystals in the absence of surfactant molecules.

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Biography

Ms Liu Yanqiong received her Bachelor’s Degree from the Department of Materials Science, National University of Singapore (NUS) in 2007. She is currently pursuing her PhD degree in Department of Materials Science and Engineering, NUS, under the guidance of Professor John Wang. Her PhD research interest was interparticle interaction among nanoparticles and their formation of mesocrystals. Her current research interest is fetal cell sorting by superparamagnetic Fe₃O₄ particles.

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