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Synthesis of anatase TiO₂ nanocrystals by low temperature sol-gel method modified with a hydrophobic ionic liquid YEN-HUI LIU, CHIH-WEI LIN, ARNOLD CHANG-MOU YANG, Department of Materials Science and Engineering, National Tsing Hua University, Hsinchu, Taiwan, MIN-CHAO CHANG, HSIN SHAO, Center for Environmental, Safety and Health Technology Development, ITRI, Hsinchu, Taiwan, CHIH-JEN LIN, LI-JIAUN LIN, Materials Research Laboratories, ITRI, Hsinchu, Taiwan — Anatase TiO₂ nanocrystals of uniform sizes were synthesized via low temperature sol-gel reaction of titanium tetraisopropoxide (TIP) with water in the presence of small amount of hydrophobic ionic liquid (IL) molecules. It was found that the IL molecules did not actively participate in precursor hydrolysis and TiO_2 nucleation. However, the IL molecules strongly screened the abundant remaining hydroxylic bonds on the surfaces of the primordial TiO_2 particles, giving rise to low temperature transition to anatase phase at 100 °C and impeded inter-particle sintering. The former was believably induced by self-organization of the IL molecules that adsorbed on the hydroxylic bonds. This IL-modified sol-gel reaction resulted in uniform sized ($\sim 10 \text{ nm}$) anatase TiO₂ nanocrystalline particles, useful for high efficiency photo-catalytic applications.

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