

Formation of Spherical Crystalline Mesoporous TiO₂ Particles by only Chemical Reaction without Calcination Process; Gel-Sol Method

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A thermally stable mesoporous spherical TiO₂ powders with a crystalline framework, high surface area, and large pores was synthesized by novel and simple alkoxide gel-sol method using titanyl acylate gel [Ti(OiPr)_{4-x}(OAc)_x] as a precursor in 0.15N KOH solution. The experiment was performed directly at reaction temperature in the 15°C~95°C and atmospheric pressure without hydrothermal process and using the block copolymer. XRD analysis indicates that the anatase and rutile phase were formed pH range in 2~12 and in below 2, respectively. The synthesized anatase phase was stable up to calcination temperature of 1000°C. The highest specific surface area (BET) was obtained about 232m²/g at the reaction temperature of 55°C. When the calcination temperatures increase, the adsorption-desorption isotherm plot according to the BDDT classification goes from a type IV isotherm to a type II isotherm. The hysteresis loop also exhibit a continuous evolution from type E corresponding to ink-bottle pores to type A cylinder-shapes pores for large particles diameter samples.