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Removal of Methylene Blue from Water Using Porous TiO₂/Silica Gel Prepared by Atomic Layer Deposition

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In the present work, TiO₂ films supported by porous silica gel with high surface area synthesized by atomic layer deposition(ALD). Porous structure of silica substrate could be maintained even after deposit large amount of TiO₂ (500 cycles of ALD process), suggesting the differential growth mode of TiO₂ on top surface and inside the pore. All the TiO₂ -covered silica samples showed improved MB adsorption abilities, comparing to bare one. In addition, when silica surface was covered with TiO₂ films, MB adsorption capacity was almost fully recovered by re-annealing process (500°C, for 1 hr, in ambient pressure), whereas MB adsorption capacity of bare silica was decreased after re-heating process. FT-IR study demonstrated that TiO₂ film could prevent deposition of surface-bound intermediate species during thermal decomposition of adsorbed MB molecules. Photocatalytic activity of TiO₂/silica sample was also investigated.

Keywords: Titania-silica catalyst, porous material, atomic layer deposition, adsorption, photocatalysis