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Immobilization of photocatalytically active TiO₂ nanopowder by high shear granulation

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Abstract

Nano-TiO₂ powder is known to show high photocatalytic reactivity in the degradation of several organic pollutants. In this work, the powder was fixed on the surface of SiO₂ granules with the size of several micrometers using a high shear granulation process. Nanozirconia sol was applied as an inorganic binder. When the samples were tempered at 300 °C, they showed high stability in an aqueous solution for several hours. An energy dispersive x-ray spectroscopy (EDX) analysis confirmed that the cores and shells of the granules consisted solely of SiO₂ and TiO₂ respectively, and that ZrO₂ was found throughout the whole granules. Methylene blue (MB) was employed as a model system to evaluate the photocatalytic activity of the TiO₂ nanopowder and coated granules. It was shown that the TiO₂-coated granules lead to the degradation of MB under UV irradiation, whereas no effect was observed in the dark. After the degradation experiments the granules could be recovered and they remained active for further applications.

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