Preparation of Nano-TiO_2/Fly Ash Beads Composite Material and Photocatalytic Properties

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Keywords	Composite, Fly Ash Bead, Hydrolysis, Nano-TiO_2, Photocatalytic

Abstract	Using TiCl4 as the titanium source, urea as the precipitating agent, nano-TiO2/fly ash beads composite materials were prepared by hydrolysis-precipitation method. The materials were characterized by SEM and XRD methods. SEM observation shows that the surface of beads have been loaded a uniform TiO2 film. XRD results shows that TiO2 films have the main phases of anatase and rutile mixed crystal structure. The effect of surface activation process of fly ash beads on TiCl4 solution hydrolysis rate was studied. The influence of calcination temperature on the microstructure and properties of composite materials was also discussed. The photocatalytic properties of the prepared materials was measured by using UV-1800 uv-vis spectrophotometer. The results show that: The composite which calcined at 500℃ has a grain size of 15nm, anatase phase content of 90%, shows the best photocatalytic effect. The degradation rate of methyl orange solution can reach 95% after 2 hours irradiation (300W, Mercury lamp). Repeated experiments show that the degradation rate of composite materials still reach 80% after being used for 5 times .

First page example

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Preparation of nano-TiO_2/Fly Ash Beads Composite Material and Photocatalytic Properties

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Key words: Hydrolysis, nano-TiO2, Composite, Photocatalytic, Fly ash bead.

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Introduction

Nano TiO_2 has strong absorptivity to ultraviolet light among the mateirals of oxide semiconductor. Under the radiation of UV-light it will generate plenty of electrons and holes, having great oxidation-reduction properties. Due to its good chemical stability, strong oxidation susceptibility, low cost, excellent photocatalytic ability, pollution-free and so on, it was widespread used at waste water treatment, air purification, self-cleaning etc., so it became one of the catalytic materials which has good potential for future development. But nano TiO_2 is easy to reunite during the preparation, and it is hard to separate and recycle from waste water after degradation, which limits its application in the photocatalysis fields[1-5]. In order to avoid reunion and convenient recycling, researchers loaded it on various substrates such as glass beads, zeolite, bamboo charcoal, mica, etc. [6-10].

Fly ash beads is one kind of the fly ash particles which have bead shape, thin wall, hollow core, so that it can be able to float in the water. The fly ash beads also have other properties as heat insulation, sound insulation, high-temperature resistance and so on. Its main chemical compositions are SiO_2, Al_2O_3 , MgO, and Fe_2O_3. The general size is among 1-100 μm. Due to its large size, hollow core, good dispersity in solution, and low cost, it can be used as the ideal carrier of nano-TiO_2[11-13].