Size-Controllable synthesis of porous TiO₂ nanoparticles with improved photocatalytic performance

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INTRODUCTION

Contaminants in water system
- Dyes from textile fabrication
- Pesticides from agriculture
- Organic pollutants from other industries and daily life

Advantages of photocatalysts
- Effective oxidation process
- Time-efficient
- Versatile for water, air purification and deodorization

Organic Pollutions in Water
Photocatalytic degradation

scheme: Mechanism of heterogeneous photocatalytic process for organic pollutants degradation

OBJECTIVE & METHODS

Objective and goal:
- Control over hydrolysis and condensation rates for sol-gel system
- Customize the surface properties and crystallinity with a simple and facile templating method
- Prepare highly-efficient titania photocatalysts with excellent organic degradation capacity

Controllable synthesis of porous TiO₂ was achieved with CaCO₃ templating

A CaCO₃-templated modified sol-gel routine using valeric acid as a chelating agent, followed by acidification for template removal, was developed to synthesize size-controllable porous titania

CONCLUSIONS & FUTURE WORK

- A simple and cost-effective sol-gel CaCO₃ templating method was developed to create nano/meso porous anatase titanium dioxide particles in different sizes.
- Photocatalytic performance was proved to be related to surface area, porosity and particle sizes.
- Future work might focus on further studies on surface properties such as detailed pore size distribution.