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TITLE

Hierarchical Assembly of Photocatalysts with High Activities

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Photocatalysis has been under intense investigation due to its potential in hydrogen production by splitting water and the environmental cleaning by degrading organic pollutants. Both the composition and the structure play key roles in determining the photocatalytic efficiency via enhancing the light absorbance and inhibiting photoelectron-hole recombination. Herein, we report the hierarchical assembly of various photocatalysts with the aim to improve photocatalytic performance and promote the practical applications in water and air cleaning.

1. Preparation of photocatalysts under supercritical conditions: Based on this method, we prepared porous La_2O_3-, CdS-, N-, S-, F-, B-doped TiO_2 with large surface area and high crystallization degree of anatase phase, corresponding to the enhanced photocatalytic activity in photocatalysis. Meanwhile, these photocatalysts also displayed excellent durability owing to the strong interaction between dopants and TiO_2.

2. Nonhydrolytic solvothermal synthesis of photocatalysts: Based on such technology, we successfully synthesized the Au/TiO_2 and Bi_2O_3/TiO_2 with ordered mesoporous structure, the mesoporous core-shell microspheres of undoped and Au or Bi_2O_3-doped TiO_2, the lamellar, foam-like, sponge-like, flower-like, pumpkin-like and nanotube-like TiO_2. Meanwhile, the TiO_2 and WO_3 single-crystals with dominant (001) facets were also synthesized. The promoting effects from both structural characteristics and dopants were examined and well discussed based on detailed characterizations.

3. Aerosol-spray synthesis of photocatalysts: Based on this strategy, we synthesized porous $Bi_2Ti_2O_7$, hollow $BiFeO_3$, and single-crystalline $TiOF_2$, which exhibited much higher activity than those reported so far owing to the enhancement in surface area, crystallization degree, and light absorbance.

4. Design of photocatalytic reactors for practical applications: By using the as-prepared photocatalysts, two kinds of photocatalytic reactors were developed which exhibited high efficiencies in cleaning water and air.

Biography

Prof. Li has completed his Ph.D from Fudan University in China. He is the President of Shanghai University of Electric Power and a director of The Chinese Education Ministry Key Lab. He has published 121 papers including Nature Commun., JACS, Angew. Chem. Int. Ed. etc. and is serving as an editorial board member of Catal. Commun., Open Catal. J., Current Catal. and Res. Chem. Inter.