

Hydrothermal Synthesis of Porous Ag₂S Sensitized TiO₂ Catalysts and Their Photocatalytic Activities in the Visible Light Range

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摘要 Porous Ag₂S sensitized TiO₂ catalysts were synthesized by the hydrothermal process. The crystallization and porous structure of the Ag₂S/TiO₂ composite photocatalysts were investigated by X-ray diffraction, scanning electron microscopy with energy dispersive X-ray analysis, [UV-Vis diffuse reflectance spectroscopy](#), and N₂ adsorption. The Ag₂S/TiO₂ composites were mainly composed of anatase TiO₂ and acanthite Ag₂S. The absorption edge wavelengths of TiO₂ and the Ag₂S/TiO₂ composite prepared with 3 mmol Na₂S • 5H₂O were 400 and 800 nm, respectively, that is, the absorption edge of the composite had a pronounced red shift. The photocatalytic activity under visible light was investigated by the degradation of methylene blue with a UV-Vis spectrophotometer. The photocatalytic activities under visible light of the Ag₂S/TiO₂ photocatalysts were much higher than that of TiO₂.

关键词: [silver sulfide](#) [titanium dioxide](#) [visible light](#) [photocatalytic activity](#) [methylene blue](#)

Abstract: Porous Ag₂S sensitized TiO₂ catalysts were synthesized by the hydrothermal process. The crystallization and porous structure of the Ag₂S/TiO₂ composite photocatalysts were investigated by X-ray diffraction, scanning electron microscopy with energy dispersive X-ray analysis, [UV-Vis diffuse reflectance spectroscopy](#), and N₂ adsorption. The Ag₂S/TiO₂ composites were mainly composed of anatase TiO₂ and acanthite Ag₂S. The absorption edge wavelengths of TiO₂ and the Ag₂S/TiO₂ composite prepared with 3 mmol Na₂S • 5H₂O were 400 and 800 nm, respectively, that is, the absorption edge of the composite had a pronounced red shift. The photocatalytic activity under visible light was investigated by the degradation of methylene blue with a UV-Vis spectrophotometer. The photocatalytic activities under visible light of the Ag₂S/TiO₂ photocatalysts were much higher than that of TiO₂.

Keywords: [silver sulfide](#), [titanium dioxide](#), [visible light](#), [photocatalytic activity](#), [methylene blue](#)

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- [1] Chatterjee D, Dasgupta S. J Photochem Photobiol C, 2005, 6: 186 
- [2] Augugliaro V, Litter M, Palmisano L, Soria J. J Photochem Photobiol C, 2006, 7: 127 
- [3] Linsebigler A L, Lu G, Yates J T. Chem Rev, 1995, 95: 735 
- [4] Romero M, Blanco J, Sanchez B, Vidal A, Malato S, Cardona A I, Garcia E. Solar Energy, 1999, 66: 169 
- [5] Kim D H, Choi D-K, Kim S-J, Lee K S. Catal Commun, 2008, 9: 654 
- [6] Yang J, Bai H Z, Jiang Q, Lian J S. Thin Solid Films, 2008, 516: 1736 
- [7] Jiang D, Xu Y, Hou B, Wu D, Sun Y H. J Solid State Chem, 2007, 180: 1787 
- [8] Brahim R, Bessekhouad Y, Bouguelia A, Trari M. J Photo-chem Photobiol A, 2008, 194: 173 

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- [9] Vogel R, Hoyer P, Weller H. *J Phys Chem*, 1994, 98: 3183 
- [10] Kryukov A I, Kuehmii S Ya, Pokhodenko V D. *Theor Exp Chem*, 2000, 36: 63 
- [11] Akamatsu K, Takei S, Mizuhata M, Kajinami A, Deki S, Takeoka S, Fujii M, Hayashi S, Yamamoto K. *Thin Solid Films*, 2000, 359: 55 
- [12] Sun Y P, Riggs J E, Rollins H W, Guduru R. *J Phys Chem B*, 1999, 103: 77 
- [13] Hodes G, Manassen J, Cahen D. *Nature*, 1976, 261: 403 
- [14] Kitova S, Eneva J, Panov A, Haefke H. *J Imaging Sci Technol*, 1994, 38: 484
- [15] Hull S, Keen D A, Sivia D S, Madden P A, Wilson M. *J Phys Condens Matter*, 2002, 14: L9
- [16] Minami T. *J Non-Cryst Solids*, 1987, 95: 107 
- [17] De Rycke G L, Henderickx F. EP 89202613.9. 1990
- [18] Zhu L, Meng Z D, Oh W C. *Chin J Catal*, 2011, 32: 926 
- [19] Zhang W X, Zhang L, Hui Z H, Zhang X M, Qian Y T. *Solid State Ionics*, 2000, 130: 111 
- [20] Lin H, Huang C P, Li W, Ni C, Shah S I, Tseng Y-H. *Appl Catal B*, 2006, 68: 1 
- [21] Hasnat M A, Siddiquey I A, Nuruddin A. *Dyes Pigm*, 2005, 66: 185 
- [22] Ho W K, Yu J C. *J Mol Catal A*, 2006, 247: 268 
- [23] El-Sheikh A H, Newman A P, Al-Daffae H, Phull S, Cresswell N, York S. *Surf Coat Technol*, 2004, 187: 284 
- [24] Zhao W X, Bai Z P, Ren A L, Cuo B, Wu C. *Appl Surf Sci*, 2010, 256: 3493 
- [25] Li H, Zhu B L, Feng Y F, Wang S R, Zhang S M, Huang W P. *J Solid State Chem*, 2007, 180: 2136 
- [26] Xie Y, Heo S H, Kim Y N, Yoo S H, Cho S O. *Nanotechnol-ogy*, 2010, 21: 015703
- [27] Kaneko M, Okura I eds. *Photocatalysis: Science and Technol-ogy*. New York: Springer, 2002. 261
- [28] Hoare J P. In: Bard A J, Parsons R, Jordan J eds. *Standard Po-tentials in Aqueous Solution*. New York: Marcel Dekker, 1985. 49
- [1] R. M. MOHAMED, Elham S. AAZAM.H₂ Production with Low CO Selectivity from Photocatalytic Reforming of Glucose on Ni/TiO₂-SiO₂ [J]. *催化学报*, 2012,33(2): 247-253
- [2] MENG Zada, ZHU Lei, CHOI Jong-geun, PARK Chong-yeon, OH Won-chun.Rare Earth Oxide-Treated Fullerene and Titania Composites with Enhanced Photocatalytic Activity for the Degradation of Methylene Blue[J]. *催化学报*, 2011,32(9): 1457-1464
- [3] M. ESMAILI, A. HABIBI-YANGJEH*.Microwave-Assisted Preparation of CdS Nanoparticles in a Halide-Free Ionic Liquid and Their Photocatalytic Activities[J]. *催化学报*, 2011,32(6): 933-938
- [4] ZHU Lei, MENG Zeda, OH WonChun*.Fabrication and Characterization of Tailored TiO₂ and WO₃/MWCNT Composites for Methylene Blue Decomposition[J]. *催化学报*, 2011,32(6): 926-932
- [5] OH Won-Chun, CHEN Mingliang, CHO Kwangyoun, KIM Cheolkyu, MENG Zeda, ZHU Lei.Synthesis of Graphene-CdSe Composite by a Simple Hydrothermal Method and Its Photocatalytic Degradation of Organic Dyes[J]. *催化学报*, 2011,32(10): 1577-1583
- [6] ZHANG Kan;MENG Zeda;OH Wonchun*.紫外光照射下 Fe-碳纳米管/TiO₂ 复合材料降解罗丹明 B[J]. *催化学报*, 2010,31(7): 751-758
- [7] H. R. POURTEDEL1,* , A. KADKHODAIE2.氧化铈纳米粒子光催化降解亚甲基蓝的动力学和机理[J]. *催化学报*, 2010,31(11): 1328-1334