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Construction of Bi_2WO_6 with oxygen vacancies and investigation on mechanisms of significantly enhanced photocatalytic activity

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ABSTRACT

Bi_2WO_6 nanosheets with gradient oxygen vacancies were synthesized by acetic acid solvothermal and subsequent calcination. The photocatalytic activity of the calcined Bi_2WO_6 was significantly enhanced. The calcination regulated the oxygen vacancy in Bi_2WO_6. Oxygen vacancy defects helped to adjust the band structure and change the surface chemical state. At the same time, the electrons were the main charge carriers of the *n*-type semiconductor Bi_2WO_6. Part of the electrons was captured by the oxygen vacancies to promote the separation of the holes. Some of the electrons reacted with oxygen to generate $^{\bullet}O_2^-$. The h^+ and $^{\bullet}O_2^-$ were the main active species that degraded rhodamine B. Among them, Bi_2WO_6 with 1 h of calcination at 315°C (Bi_2WO_6-315°C 1 h) exhibited the optimal photocatalytic activity. The degradation velocity of rhodamine B over Bi_2WO_6 was 21.4 times that of Bi_2WO_6 under the same reaction condition.

Keywords: Photocatalysis; Bismuth tungstate; Defect; Oxygen vacancy; Radical reactions

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