



Historical Perspective

A systematic review on Nb₂O₅-based photocatalysts: Crystallography, synthetic methods, design strategies, and photocatalytic mechanisms

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Abstract

With the increasing popularity of photocatalytic technology and the highly growing issues of energy scarcity and environmental pollution, there is an increasing interest in extremely efficient photocatalytic systems. The widespread immense attention and applicability of Nb₂O₅ photocatalysts can be attributed to their multiple benefits, including strong redox potentials, non-toxicity, earth abundance, corrosion resistance, and efficient thermal and chemical stability. However, the large-scale application of Nb₂O₅ is currently impeded by the barriers of rapid recombination loss of photo-activated electron/hole pairs and the inadequacy of visible light absorption. To overcome these constraints, plentiful design strategies have been directed at modulating the morphology, electronic band structure, and optical properties of Nb₂O₅. The current review offers an extensive analysis of Nb₂O₅-based photocatalysts, with a particular emphasis on crystallography, synthetic methods, design strategies, and photocatalytic mechanisms. Finally, an outline of future research directions and challenges in developing Nb₂O₅-based materials with excellent photocatalytic performance is presented.