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Mechanochemical synthesis of novel heterostructured Bi₂S₃/Zn-Al layered double hydroxide nano-particles as efficient visible light reactive Z-scheme photocatalysts

Zhao Li¹, Qiwu Zhang^{1,2,*}, Xinzhong Liu³, Min Chen¹, Lei Wu¹, Ziqiang Ai¹

1. School of Resources and Environmental Engineering, Wuhan University of Technology, Wuhan 430070, China

2. Hubei Key Laboratory of Mineral Resources Processing and Environment, Wuhan University of Technology,

Wuhan, 430070, China

3. College of Ecological Environment and Urban Construction, Fujian University of Technology, Fuzhou 350118,

China

Abstract

Herein, we demonstrated, for the first time, the synthesis of novel Z-scheme heterostructures of Bi₂S₃/Zn-Al LDH nanoparticles via a mechanochemical route, and the high efficiency as visible-light-driven photocatalysts for the degradation of organic pollutant of methylene blue dye (MB). The samples were characterized comprehensively by a set of analytical methods: XRD, XPS, FTIR, UV/VIS/NIR spectroscopy, SEM-EDS, BET measurement, EIS analysis, PL measurement, ESR, Hall Effect measurement and quantitative evaluation of photocatalytic degradation of MB under visible light irradiation. Compared with the pure Bi₂S₃, greatly enhanced photocatalytic activity from the Bi₂S₃/LDH nanoparticles was observed and a possible mechanism ascribed to the formation of Z-scheme was discussed based on the well matching results from the characterizations by different methods. No obvious decrease in the activity was observed with the reused examination. The easy preparation of the efficient LDH-based Z-scheme photocatalytic systems through

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