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## Influence of Zn/Mo molar ratio on the phase composition, morphology, and photocatalytic activity of zinc molybdates prepared by hydrothermal method

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We report herein the synthesis of zinc molybdates by hydrothermal method. The study addresses the investigation of the effects of zinc to molybdenum molar ratio of starting materials, temperature, and reaction time on the phase composition, morphology, and photocatalytic activity of the zinc molybdates in the photodegradation of pirimicarb under UV light irradiation. The as-prepared zinc molybdates are characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), X-ray photoelectron spectroscopy (XPS), and UV–vis diffuse reflectance spectra (DRS). The results show that the pure phase of zinc molybdates can be prepared under equal Zn/Mo ratio or excess zinc condition. The pure phase photocatalysts manifest enhanced light absorption properties and plate-like morphologies. In contrast, the zinc molybdates prepared under an excess of molybdenum are not pure phase materials and appear as spherical particles with poor light absorption ability. The molar ratio of Zn:Mo is an important factor that is found to affect the photocatalytic activity of the zinc molybdates. The optimal molar ratio of Zn:Mo is 1:1 at a reaction temperature of 180 °C for 8 h, at which the catalyst exhibits the highest photocatalytic activity with 98.5% degradation of pirimicarb after 10 h of irradiation. Moreover, the as-prepared zinc molybdate materials show extremely high photostability and maintain high photocatalytic activity after three successive cycles. The scavenger studies indicate that hydroxyl radicals and holes are the main active species in the degradation of pirimicarb. Liquid chromatography coupled with electrospray ionization mass spectrometry is applied to the analysis of the samples derived from the study of photocatalytic degradation of pirimicarb using the prepared catalysts. Potential degradation pathways for pirimicarb are evaluated expressing two different degradation pathways, namely dealkylation and decarbamoylation. The excellent activity and photostability reveal that zinc molybdates are promising photocatalysts for water and wastewater treatment.

### Biography

Chung-Shin Lu received the Ph.D. degree in Chemistry from the Tsing Hua University, Taiwan, in 1994. He is currently a Professor at the National Taichung University of Science and Technology, Taichung, Taiwan. His interests are focused on the analysis and treatment of environmental pollutants. His laboratory is currently working on the synthesis of various photocatalysts and investigating their photocatalytic abilities for removing organic pollutants in an aqueous solution.

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