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Photocatalytic degradation of methylene blue using sprayed Mg diluted ZnO heterostructure thin films photocatalysts

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Abstract
The thin layers of ZnOx%/MgO [x = 30, 40 and 50 at%], were prepared by the spray pyrolysis method on glass substrates at 450 °C, then tested for methyl blue (MB) degradation under visible irradiations. The ZnOx%/MgO [x = 30,40 and 50 at%] thin films were analysed by X-ray diffraction (XRD), scanning electron microscopy (SEM), UV–Vis spectroscopy and Mott-Schottky analysis. X-ray diffraction analysis revealed that the layers have a polycrystalline nature of hexagonal (wurtzite) and cubic structure. Microstructures the films were also analyzed using scanning electron. The films show a radical change in the surface morphology in accordance with the XRD results. The above analyses confirm the co-existence of a mixture of the wurtzite (ZnO) structure and cubic phase of MgO. The use of these mixed layers in the photo degradation of MB gave satisfactory results. Indeed, the photocatalytic tests showed the efficiency of Mg diluted ZnO films with the best yield in the case of 50% diluted ZO films. It was confirmed that the ZnO50%/MgO had a profound effect on reduction of band gap and photocatalytic performances.

Keywords ZnOx%/MgO thin films · Structural · Microstructural and optical properties · Photocatalysis

Introduction

Oxides semiconductor in the form of thin-film, and in particular zinc oxide (ZnO), have been the subject of a great deal of research work. The development of these materials is linked to their interesting physical properties. ZnO is a semiconductor exhibiting an

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