

Influence of the zinc precursors solutions on the photocatalytic activity of ZnO sol gel films

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Thin ZnO films are successfully prepared on glass substrates by the sol-gel method using both dip coating and spin coating techniques. Two different procedures are applied for preparation of the films: (i) polymer modified (zinc acetate and polyvinyl alcohol) and (ii) classical sol gel method (zinc acetate with complex agent monoethanolamine).

The films are characterized by means of X-ray diffraction (XRD), Scanning Electron Microscopy (SEM), X-ray Photoelectron Spectroscopy (XPS), Fourier Transform Infrared Spectroscopy (FT-IR) and Thermal Analyses (TG-DTA).

The mean crystallite size, estimated by the Sherrer's formula for the polymeric-derived films, is 10-12 nm, while for the films obtained by procedure (ii) is about 30 nm. The films prepared by complex agent solution possess many ganglias on the surface, while the polymer modified solutions leads to a formation of some ganglia aggregates.

The as-obtained ZnO films are studied with respect to the photo-initiated bleaching of malachite green under UV illumination in aqueous solutions. It turns out that the films obtained by zinc acetate with complex agent solution have a better photocatalytic activity than those by polymer modified solution. It is proven that the films have also some activity in darkness, which is lower than the activities under UV light.

The results obtained show that the films morphology has more significant influence on the photocatalytic properties than the size of the crystallites.

The ZnO thin films prepared by us are promising as efficient photocatalyst for degradation of malachite green dye.