Effect of manganese on the photocatalytic performance of ZnO thin films

Elisaveta Krasimirova, Borjana Donkova and Ceco Dushkin

Department of General and Inorganic Chemistry, Faculty of Chemistry,
University of Sofia, 1126 Sofia, Bulgaria.
E-mail: bdonkova@inorg.chem.uni-sofia.bg

The photodegradation of organic pollutants in air or aqueous medium, catalyzed by various semiconductors, is a promising remediation technology especially at lower concentration of the pollutant. Among the various semiconductors used, ZnO has been recognized as one of the attractive materials for its biological and chemical inertness, high catalytic efficiency, low cost and environmental sustainability. On the other hand, ZnO is used as a UV-blocker agent because it adsorbs light in the whole region of the UV-spectrum (UVA and UVB). Depending of the application, the photocatalytic properties of ZnO should be promoted or suppressed. This can be achieved by changing the particle size and/or by doping.

In the present study, the effect of manganese on the photocatalytic performance of ZnO thin films is investigated. The activity of ZnO and Mn/ZnO thin films is tested in the reaction of photoassisted bleaching of the organic dye Malachite green. The thin films are synthesized via the sol-gel method from $Zn(CH_3COO)_2 \cdot 2H_2O$, monoethanolamine for stabilization of the solution and 2-metoxyethanol like a solvent. For Mn-doping $Mn(CH_3COO)_2 \cdot H_2O$ is used at the ratio of Mn^{2+} to Zn^{2+} in the solution being 1:99. The samples are characterized by XRD and SEM.

The XRD analysis shows the formation of ZnO with a wurtzite structure. The films possess ganglia-like morphology and the ganglia consist of separate grains. The photocatalytic tests show the effect of the dopant on the catalytic performance of ZnO. The results are compared with our previous data for the activity of doped ZnO thin films, obtained by different method and precursor.

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