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# Photoelectrocatalytic Degradation of Methylene Blue and Inactivation of Escherichia coli by Spray Deposited Au:ZnO Thin Films

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## Abstract

***Abstract***

*Spray deposited Au-doped ZnO thin films were successfully prepared by using zinc acetate as precursor onto the glass and fluorine doped tin oxide (FTO) coated glass substrates at 400$^0$C. In this study, the polycrystalline Au:ZnO films were prepared with the different Au concentration in the starting solution varying from 0 to 4%. The optimized Au doping concentration was 3%. The direct optical band gap of the Au:ZnO film (3% Au doping) was 3.10 eV. The photoelectrocatalytic activity of the prepared thin films was evaluated by measuring the photoelectrocatalytic degradation of methylene blue; 94% degradation of MB with rate constant k=0.0555/sec. Inactivation studies of suspensions of E. coli in a parallel plate reactor showed that the bacterial count can be reduced by a factor of 100 by direct UVA illumination, by a factor of $10^7$ with a ZnO electrode with applied external bias of 1.5 V versus a stainless steel counter electrode, and by a factor of $10^{12}$ under a photocurrent of 18 mA across the Au:ZnO electrode with applied external bias of 1.5 V versus a stainless steel counter electrode. The high antibacterial activity in the latter case is ascribed to the suppression of charge carrier recombination and auxiliary radical reactions occurring at the surface of bacteria adsorbed on the Au:ZnO electrode. The Au:ZnO improved photoelectrocatalytic degradation of MB and inactivation efficiency of E. coli.*

***Keywords:*** *Au:ZnO thin films, photoelectrocatalysis, degradation, methylene blue, E. coli*

**Cite this Article**

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