

Rhodamine (B) photocatalysis under solar light on high crystalline ZnO films grown by home-made DC sputtering.

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Abstract: ZnO thin films were deposited by home-made DC sputtering of zinc target under mixed gases (Argon, Oxygen) plasma on glass substrates. Films were deposited by varying oxygen partial pressure (PO_2) from 0.09 to 1.3 mbar in the deposition chamber, at a fixed substrate temperature of 100 °C. The samples were characterized by photoluminescence (PL), X-ray diffraction (XRD), optical transmissions (UV-vis), scanning electron microscopy (SEM) and electrical (Hall effect) measurements. The results indicate that by varying the oxygen pressure in the deposition chamber, the films show a precise and well defined photoluminescence emissions for each range of pressure covering almost the entire visible domain (UV, UV-Violet, Violet, Blue, and Red) with high intensities. Moreover, the deposited films have different defects levels. The XRD analysis indicates that the films are well grown along the c-axis peak, but with different crystalline quality. Optical measurements reveal a high transmission, up to 90%, in the spectral region between 400 and 2500 nm and a large variation of the optical band gap (3.16 – 4.34 eV). As an application of the deposited ZnO films, the photo-catalytic degradation of a synthetic solution of Rhodamine B (RhB) poured on a ZnO thin film was successfully achieved and an elimination rate of 38% was obtained after exposing the film to solar light for 3 h.

Keywords : ZnO thin films, sputtering, Photoluminescence, Rhodamine (B), Solar light, Photocatalysis.