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Effect of co-sputtering deposition power on structure and properties of Fe doped ZnO thin films

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Fe doped ZnO (FeZO) thin films were deposited using magnetron co-sputtering (DC for Fe and RF for ZnO) on silica and silicon substrates. To better control the Fe-doping in the 1% atomic range, instead of reducing the DC power (which produced instabilities of the DC source), we performed the DC sputtering through a grid with different mesh size to block part of the Fe atoms. The structural, optical and magnetic properties of 150 nm thick FeZO films were investigated. Single phase hexagonal wurtzite structures in all samples were confirmed by GIXRD. RBS and EDX were used to determine the elemental composition and stoichiometry of the ZnO films doped with Fe. A variation of the FeZO bandgap from 3.21 eV (pure ZnO) to 3.33 eV (5% Fe in ZnO) has been obtained from the optical transmittance using UV-Vis optical spectroscopy. Moreover, the room temperature M-H hysteresis loops for FeZO films were investigated by vibrating sample magnetometer (VSM). A ferromagnetic behavior was obtained in the pure ZnO film, possibly due to surface defects such as oxygen vacancies, whereas a paramagnetic one was found for the FeZO ones. These various properties make FeZO in thin film form a promising candidate material in wide range applications in photocatalysis and in magneto-optical devices, which we plan to investigate in our future work.

Biography

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