Structural and optical properties of ZnO:Ir thin films deposited by reactive magnetron co-sputtering

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One of the obstacles to further developments of transparent electronics based on transparent conductive oxide (TCO) thin films is lack of p-type conductors. Polycrystalline spinel $ZnIr_2O_4$ thin films with appropriate acceptor defects are shown as p-type conductors by experimental and theoretical studies. Light ZnO doping with Ir has been studied only with first principles DFT calculation without any experimental investigation.

ZnO:Ir thin films were deposited by reactive magnetron co-sputtering from a metallic Zn and Ir targets in an $Ar+O_2$ atmosphere (Fig. 1). Zn target was driven at constant 200 W (DC) regime, but Ir at low power (6 – 25 W) and low frequency (100 Hz) pulse regime with additional grid above the target in the order to decrease the sputtering and deposition rate of the Ir. A set of samples was deposited at different Ir target (cathode) powers to vary the Ir concentration in the films (Fig. 2). Substrate temperature was kept at 300 °C and working pressure at 10 mTorr.

Composition and structural, optical properties of the ZnO:Ir thin films were studied by XRF, XRD, SEM, TEM, Raman, FTIR techniques, as well as two beam optical spectrophotometry.

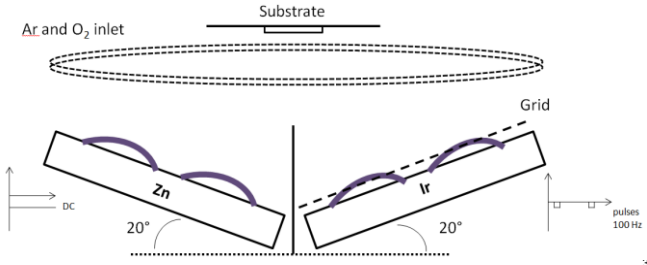

Fig.1 Scheme of reactive magnetron co-sputtering

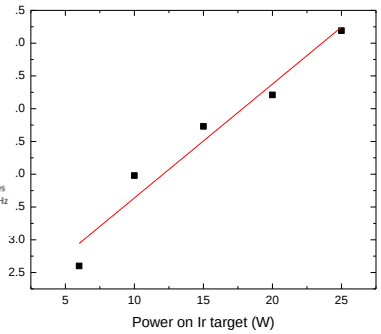

Fig.2 Ir concentration in the films as a function of power on the Ir target

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