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Electrical and optical characterization of Ag_xO films deposited by RF reactive magnetron sputtering

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Abstract: Silver oxide (Ag_xO) has huge potential in the catalysts and semiconductor devices applications and thus it is of great significance to characterize its semiconductor properties. Here, by using the RF reactive magnetron sputtering method under different substrate temperatures, 40, 100, and 200 °C, respectively, three Ag_xO films were prepared and their semiconductor properties were carefully investigated through X-ray diffraction, Hall measurement, transmittance and photoluminescence spectrum. The main phase of the Ag_xO films sputtered at 40 and 100 °C is found to be AgO, while that sputtered at 200 °C is Ag_2O. The resistivity of the Ag_xO films increases with the substrate temperature and the mobility of the AgO films are about 21 and 15 $cm^2/V{\cdot}s$ for the 40 and 100 °C deposited films, respectively. Photoluminescence measurement results suggest that the band gaps of Ag_2O and AgO films are both 3.4 eV, and the emission bands in the visual light region indicate the existence of amount of defects in the Ag_xO films. Moreover, the defect levels in the band gap deduced from the transmittance spectra are consistent with that from the