The temperature dependece of Hall mobility of the oxide thin film In_2O_3-ZnO

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We report that temperature dependence of Hall mobility of the strongly disordered films In_2O_3-ZnO. We made targets by mixing In_2O_3 with ZnO at the ratio $0 \sim 4$ %wt. Sputtering those targets on glass substrate by DC magnetron method, amorphous films with 25 nm thickness were obtained. By annealing at $T = 150 \sim 350^{O}$C in the air, these films were crystallized and oxygen defect decreased and the conductance decreased. We obtained polyline films with conductivity 0.2mS/m $\sim$ 300S/m. These conductivity changes due to environment such as light and gas. The grain size $\sim 20nm$ of films was measured by scanning electron microscopy. In the temperaute range $T = 90 \sim 300$K, we measured the Hall effect of these fims. The density of electron was $4 \times 10^{18} \sim 7 \times 10^{23}\text{m}^{-3}$ at the room temperature. The Hall mobility μ_H shows the thermal-activation-like temperature dependence $\mu_H \propto exp(E_B/k_BT)$. Where E_B is activation energy. By fitting, we obtained $E_B = 17 \sim 67meV$.