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Characterization of Epitaxial $Ag_{2-x}O$ Thin Films Grown on Sapphire S.B. RIVERS, Rhode Island College, G. BERNHARDT, M.W. WRIGHT, D.J. FRANKEL, M.M. STEEVES, R.J. LAD, University of Maine — We have grown silver oxide films with a range of stoichiometry near Ag_2O by e-beam evaporation of silver in an oxygen electron cyclotron resonance (ECR) plasma. Films were deposited on r-cut sapphire substrates. A quartz crystal oscillator was used to monitor the film growth and to determine ECR oxygen flux by examining the rate of oxygen uptake on a silver film. This information was used to select the silver rate (0.1 or 1.0 Å/s) and the oxygen flow rate (from 2 to 10 sccm). XRD and RHEED analysis reveals films grew with one-dimensional <111> epitaxy, true three-dimensional <002> epitaxy, or a mixed phase depending on the deposition conditions. XRD and XPS shows the composition varies with deposition conditions and can be a mixture of AgO and Ag_2O. UV-vis spectroscopy shows that the films have a single absorption edge between 3.1 and 3.5 eV. Optical transmission from 500 to 700 nm is between 70 and 80%. Four-point van der Pauw conductivity and Hall effect measurements indicate that the $Ag_{2-x}O$ films are p-type with a conductivity on the order of 3×10^{-3} $\Omega^{-1}\text{cm}^{-1}$.

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