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Electronic and optical properties of hexagonal boron nitride thin films Y. CHEN, B. CAI, M.L. NAKARMI, Department of Physics, Graduate Center and Brooklyn College - CUNY, R.C. RAI, Department of Physics, SUNY College at Buffalo — We report the surface, structural, electronic, and optical properties of hexagonal boron nitride (h-BN) thin films grown on (0001) sapphire substrate by an electron-beam deposition technique. The h-BN thin films have been deposited in nitrogen environment and post-deposition annealed to improve the stoichiometry and the crystalline quality. Atomic force microscopy, x-ray diffraction, optical spectroscopy, and Hall-effect measurement were employed to characterize the h-BN thin films. We carried out temperature dependent transmittance measurements (78 – 450 K and 190 – 3000 nm) on the h-BN thin films in order to investigate the optical properties and the temperature dependence of the energy band gap. The optical data below the energy band gap have been modeled with the Urbach effect and a free exciton. We present the temperature dependence of a free exciton and the energy gap of undoped h-BN thin films. The results will be compared with photoluminescence measurements. We will also present the results of Mg-doped h-BN thin films in an effort to make p-type h-BN.

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