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Structural and optical properties of epitaxial Cu_2O ZnO superlattices Y.P. CHENG, Q.Y. CHEN, P.V. WADEKAR, W.C. HSIEH, C.F. CHANG, Department of Physics, National Sun Yat-Sen University, H.C. HUANG, Department of Material Science and Optoelectronics, C.M. SHIAU, Y.S. HONG, C.Y. DANG, P.C KUNG, C.H. LEE, S.H. HUANG, Z.Y. WU, Y.Y. LIANG, C.M. LIN, S.T YOU, L.W. TU, Department of Physics, National Sun Yat-Sen University, N.J. HO, Department of Material Science and Optoelectronics, C.H. LIAO, Department of Physics, R.O.C Military Academy, H.W. SEO, Department of Physics, Jeju National University, W.K. CHU, Texas Center of Superconductivity and Department of Physics — Superlattices with alternating layers of Cu_2O and ZnO have been prepared by magnetron sputtering on -sapphire (Al_2O_3) substrates at 650C. The thickness, density, and roughness of obtained samples were analyzed by X-ray reflectivity (XRR) assisted with meticulous analytical data fittings, while X-ray diffraction (XRD), Grazing Incidence X-ray Diffraction (GIXRD), and phi scans were employed to verify their epitaxial qualities. For the superlattices starting with Cu_2O, the epitaxy was superior to those starting with ZnO as judged by transmission electron microscopy (TEM) atomic imaging and associated electron diffraction. The electronic band structures based on the first-principles calculations will be illustrated in comparison with the optical transitions inferred from photoluminescence spectroscopy.

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