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Characterizations of ZnO/MoO_3 superlattices grown by Atomic Layer Deposition Y.S. HONG, 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, National Sun Yat-Sen University, C.M. SHIAU, C.H. LEE, Y.P. CHENG, C.Y. DANG, P.C. KUNG, Y.Y. LIANG, S.H. HUANG, Z.Y. WU, C.M. LIN, S.T. YU, L.W. TU, Department of Physics, National Sun Yat-Sen University, N.J. HO, Department of Material Science and Optoelectronics, National Sun Yat-Sen University, H.W. SEO, Department of Physics, Jeju National University, W.K. CHU, Texas Center of Superconductivity and Department of Physics, University of Houston — ZnO/MoO_3 superlattices (SLS) were prepared by ALD on Al_2O_3 substrates at 450K. The growth rates are 0.17 per cycle for MoO_3 and 1.66 for ZnO, according to XRR. The MoO_3 films were found amorphous when deposited separately, while ZnO polycrystalline. However MoO_3 became polycrystalline and ZnO textured grown into SLS, as judged by the electron diffraction patterns. The ZnO thicknesses were fixed at 6 nm per period while MoO_3 varied from 2 to 6 nm. The nanostructures as examined by TEM indeed show expected periodicity consistent with XRR. HRTEM also gave clear interfaces of the SLS with certain regions of imperfection. Thence, we conclude that amorphous MoO_3 would crystallize when grown adjacent to an initial layer of ZnO. PL was employed to investigate the possible variations of their bandgaps when the constituent ZnO and MoO_3 brought together in close proximity of nanoscakes. Electronic band structures according to ab initio calculations will be discussed.

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