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Simulation of ZnO-based UV and Visible Light-Emitting Diode Structures SANG YOUN HAN, HYUCKSOO YANG, D.P. NORTON, S.J. PEARTON, Department of Materials Science and Engineering, University of Florida, F. REN, Department of Chemical Engineering, University of Florida, A. OSINSKY, J.W. DONG, B. HERTOG, P.P. CHOW, SVT Associates, Inc. — Two different types of ZnO-based LED structures have been examined using a 1-D simulator that accounts for specific features of the hexagonal semiconductors - strong piezoeffects, existence of spontaneous electric polarization, low efficiency of acceptor activation, and high threading dislocation density in the material. A hybrid ZnO/ZnCdO/AlGaN/GaN structure grown on sapphire avoids problems in achieving robust p-type doping in ZnO. An all-ZnO approach employs a MgZnO/ZnCdO/MgZnO double heterostructure grown on a ZnO substrate. The band diagram of each structure is examined with simulator considering the polarization effect within this material. And it is observed that the active layer thickness and doping are important factors effecting emission intensity in these structures and the effect of polarization effects on c-plane substrates needs further study. The hybrid ZnO/GaN approach provides an alternative for achieving robust p-type doping for ZnO-based LED that incorporates ZnCdO active regions with optimized doping and thickness. These results will be useful to identify the most important parameters for achieving high brightness and high performance in ZnO based LED structures.

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