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Growth environment driven physical property changes of ZnO films[1] S.H. LEE, Y.E JEONG, H.K. KIM, D.Y. LEE, Pusan Natl Univ, J.S. BAE, Korea Basic Science Institute, W.J. LEE, Dong-Eui University, K.H PARK, Pusan Natl Univ, S.D. BU, Chonbuk National University, SUNGKYUN PARK, Pusan Natl Univ — The growth temperature and post-annealing dependent on the thermal stress of undoped ZnO films and oxygen partial pressure dependent physical properties of Pdoped ZnO films were investigated. As the growth temperature increased, the lattice constant increased and approached the bulk value, suggesting a decrease in interfacial strain between the substrate and thin film. For the post annealed films, the interfacial strain decreased further and was close to the bulk value regardless of the post annealing environments. The optical band gap varied according to the growth temperature and post annealing environments due to a decrease in the interfacial strain effect. In the case of the variation of oxygen partial pressure during the growth, the degree of crystallinity and the amount of oxygen vacancies in the films decreased with oxygen partial pressure. All films showed n-type except for a film grown at 100 mTorr, which exhibited p-type. The optical band gap energy also changed with the oxygen partial pressure. The feasible microscopic mechanism of conductivity conversion is explained in terms of the lattice constant, crystallinity, and relative roles of the substituted phosphorous in the Zn-site and/or oxygen vacancies depending on the oxygen partial pressure.

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