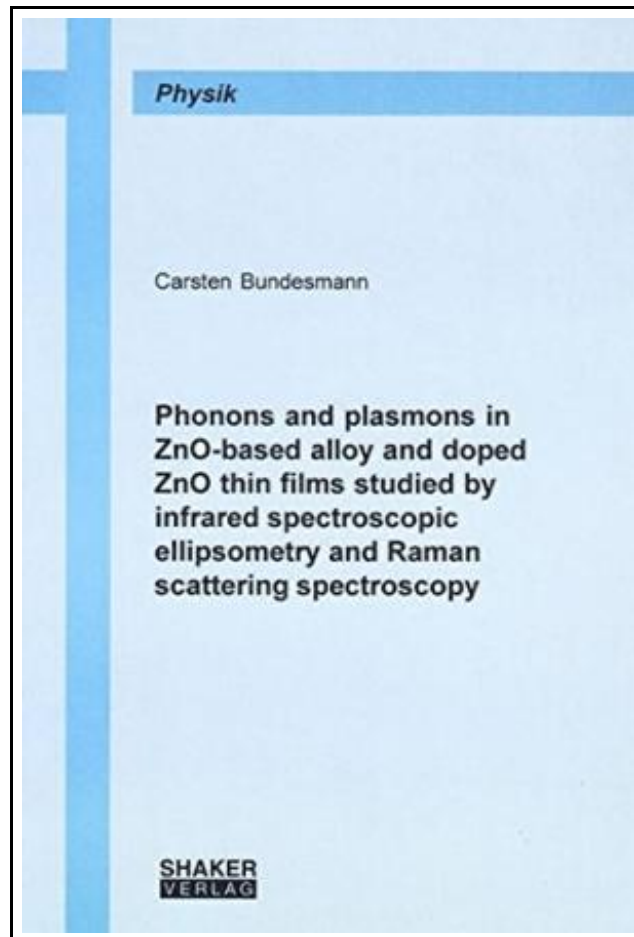


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Shaker Verlag Jan 2006, 2006. Taschenbuch. Book Condition: Neu. 210x149x12 mm. Neuware - ZnO and ZnO-based semiconductors are of physical and technological interest and currently focus of intensive research activities. The reason for the renewed interest is that ZnO-based materials are potential candidates for UV-optoelectronic (light emitting diodes, laser diodes, detectors) or spintronic devices (spin transistors or magnetic memory devices). Essential for the performance of the above addressed materials is the knowledge of fundamental properties concerning the incorporation of the alloying and doping elements. The focus of the present work is the comprehensive study of lattice (phonon) and free charge carrier (plasmon) properties of ZnO-based alloy and doped ZnO thin films, and subsequent evaluation of strain, composition, and dopant influence. The experiments are done by combination of infrared spectroscopic ellipsometry (IRSE) and Raman scattering spectroscopy. The objects of the investigations are single-crystalline (Mg, Cd, Mn, Fe, Co, Ni, Cu)ZnO-alloy and (N, Li, P, Sb, Ga, Al)-doped ZnO thin films grown by pulsed laser deposition (PLD) on sapphire substrates. For comparison, polycrystalline ZnO thin films on silicon, glass, and polyimide foil, and commercially available ZnO bulk single crystals are studied. Starting from undoped ZnO thin films and ZnO bulk single crystals, the change of phonon mode properties upon alloying and doping with several elements is investigated. Thereupon, information about crystal quality and the incorporation of the alloying and doping elements are derived. In the alloy system $\text{Mg}_x\text{Zn}_{1-x}\text{O}$ a phase transition from wurtzite- (ZnO, 4-fold coordinated) to rocksalt (MgO, 6-fold coordinated) crystal structure occurs. Upon phase transition an abrupt change of the phonon mode polarity and of the dielectric constants is observed. This should affect electronic properties, which is discussed, exemplarily, for the reduced exciton mass. For the (N, Li, P, Sb, Ga, Al)-doped ZnO thin films, the $\text{Cu}_x\text{Zn}_{1-x}\text{O}$ and $\text{Co}_x\text{Zn}_{1-x}\text{O}$ thin films...



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