TANAKORN OSOTCHAN : CRYSTAL GROWTH AND CHARACTERIZATION OF ZINC SELENIDE SEMICONDUCTOR. THESIS ADVISORS : ASSISTANT PROFESSOR SOMPHONG CHATRAPHORN AND ASSISTANT PROFESSOR KAJORNYOD YOODEE, Ph.D. 172 pp.

Single crystals of ZnSe with dimensions of 10x10x5 mm^3 were grown from vapor-phase in hydrogen atmosphere at 1100-1250 °C. The starting material was prepared by direct synthesis from Zn(99.9999%) and Se(99.999%). The crystals of larger grain and higher quality were obtained by temperature oscillation technique. X-ray powder diffraction method was used to determine the ZnSe crystal structure to be zinc-blende type with lattice constant of 5.6682±.0004 Å.

The mechanism of electrical conduction in as grown crystals could be described as space-charge-limited current process. However resistivity at microwave frequencies obtained from microwave reflection technique was $3x10^8$ Ω-cm with a dielectric constant of 8.76. The change in resistivity of ZnSe samples was studied by doping with Zn, Ga, Al and Cu respectively. Low resistivity of 0.2-0.6 Ω-cm was obtained from the Al doped samples. Carrier concentrations were also obtained by C-V measurement of MS and MIS samples.

The experimental results of optical absorption measurement show that the as grown ZnSe has direct energy gaps between 2.633 eV and 2.751 eV at temperatures from 300K down to 11K, respectively. The temperature dependence of the energy gap and the slope parameter in Urbach tail indicates that the absorption is influenced by the LO phonon-induced electric microfields. Absorption at photon energies lower than Eg is due to intraband transition and free carrier absorption.