

## MASTER'S THESIS

### Sub-band gap luminescence of ZnSe/GaAs heterojunction grown by hot wall epitaxy

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**Sub-Band Gap Luminescence of ZnSe / GaAs  
Heterojunction Grown by Hot Wall Epitaxy**

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**ABSTRACT**

ZnSe/GaAs heterojunctions are fabricated by a Closed Hot Wall Epitaxy (CHWE) system. The growth is done inside an enclosed volume, therefore, achieving thermodynamic equilibrium and avoiding the loss of source material. By controlling the source and substrate as well as wall temperatures, it is possible that the vapour deposition may lead to heteroepitaxial film. Under different kinds of measurements including structural, electrical and optical measurements, the ZnSe film grown at different conditions were investigated. The photoluminescence (PL) properties of the ZnSe films grown at these conditions are presented. The PL spectra show clear free ( $E_X$ ) and neutral donor bound ( $I_2$ ) excitons; donor acceptor pair (DAP), excited donor acceptor pair ( $D^*AP$ ) and their replicas until fourth order. From the ratio of PL intensities of replicas of DAP and  $D^*AP$  to their main peaks, we obtain the Huang-Rhys factor  $S = 0.58$ , which is consistent with other reports for acceptor bound exciton transitions. From the temperature dependence of PL intensities we show that the activation energy of thermal quenching process for DAP transitions is about 7meV. To sum up, donor and acceptor levels are present in the films grown. Nevertheless excitonic peaks observed in PL spectra give an evidence of rather good crystal structure of the films grown and the best growth condition obtained is  $T_{\text{source}} = 780^\circ\text{C}$ ,  $T_{\text{wall}} = 800^\circ\text{C}$  and  $T_{\text{substrate}} = 350^\circ\text{C}$ .

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