OPTICAL STUDIES OF CDSE SUBMONOLAYERS IN ZNSE-BASED MATRICES

Abstract

by

Mijin Kim

In this dissertation, we have studied the properties of CdSe submonolayers embedded in ZnSe matrix. The structures consist of single and multiple CdSe insertions. In some samples CdSe or ZnSe was replaced by their diluted magnetic counterpart such as CdMnSe or ZnMnSe. We used the optical methods, i.e., photoluminescence and and transmission measurements as a tool to study how Cd atoms are distributed in the plane when only a fraction of CdSe monolayer is deposited in this highly lattice mismatched system.

We studied a series of samples with varying thickness of the CdSe submonolayer and ZnSe spacers. We calculated eigenfunctions and eigenvalues of systems under investigation using numerical methods based on 8-band $\vec{k} \cdot \vec{p}$ model. In the case of single insertion, we found that for coverages smaller than 0.6 ML Cd atoms are distributed uniformly on the plane. However for higher coverages 2 dimensional Cd-rich areas begin to form. In the multilayer case the onset of islands formation takes place for higher coverages. We have also found that if Mn atoms are present in the system they alter the growth dynamics by acting as seeds for the island formation. Last, we have studied the ZnMnSe/ZnBeSe system and were able to determine the band-offset between these two materials.