Effects of SeO2 epilayer on the structural, morphological, optical and dielectric properties of nanocrystalline ZnSe thin films

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**Abstract**

Herein the effects of SeO2 coating on the physical properties of thermally evaporated nanocrystalline (NC) ZnSe thin film substrates are explorted. The formed ZnSe films showed nanocrystalline Zincblende phase. They contained excess selenium (ZnSe1.07) with relatively large defect density and displayed energy band gap of value of 3.48 eV, energy band tails of width of 1.2 eV and dielectric quality factor ($Q$) less than 100. Coating NC-ZnSe with SeO2 induced the crystallization of tetragonal SeO2 and enhanced the light absorbability of SeO2. It also reduced the defect density and stacking faults, increased the crystallites sizes, narrowed the width of band tails, increased the dielectric constant and increase the $Q$ factor up to ~400 of NC-ZnSe. In addition, analysis of the optical conductivity spectra for the NC-ZnSe/SeO2 bilayers has shown that the drift mobility, plasmon frequency and free carrier density can reach values of 30.42 cm2/Vs, 5.07 GHz and 8.0$×10^{18} $cm-3, respectively.

Keywords: NC-ZnSe/SeO2; band offset; induced crystallization; dielectric; optical receiver

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