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Author Zong Bin Jhuang
Author's Email Address No Public.
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Abstract
II-VI ZnSSeTe PD were grown by a RIBER 32P MBE system on p-GaAs substrate. The optical characteristics of ZnSSeTe epitaxial layers were examined by using photoluminescence (PL) excited by a 325nm He-Cd laser. In addition, reflection spectra was measured by using Tungsten-Halogen lamp. The responsivity spectra were investigated from 350 through 970 nm by using Xenon and Tungsten-Halogen lamp as the light source. From temperature-dependent PL spectra of the ZnSSeTe PD, the thermal activation energy corresponding to the Ten cluster-bound exciton was 92meV. We conclude that this large thermal activation energy is caused by stronger binding energy of Ten-bound excitons. From reflection spectra at 17 K, we found that three absorptions points were 2.864eV, 2.838eV, and 2.812eV. The three absorption points was corresponded to the Te1-bound state peak in PL spectrum. At -1V bias, we found that the photo responsivity spectrum was quite flat and broaden due to the fact that depletion region extended from p-GaAs substrate through ZnSSeTe in our p-down scheme. In addition, we also found that the responsivity has a sharp cut off located at 870nm corresponding to the band edge of GaAs and that the peak responsivity at 870 nm was found to be 0.288A/W. It was also found that the quantum efficency is about 41%. Such a high photo response and wide absorption spectrum might have more applications in commercial blue/UV photodetectors. In addition, when the reverse bias is greater than -2V, the appearance of 1/f noise is observed. It was found that we achieved the minimum NEP of 141pW and the maximum D* of 1.4× 1010 cmHz1/2W-1 from our ZnSSeTe photodetector at bias=-3V.
Advisory Committee Wen Ray Chen - advisor

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