

Abstract Submitted
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Temperature dependent band gaps of GeSiSn alloys grown on Ge buffered Si substrates NALIN FERNANDO, T.N. NUNLEY, S. ZOLLNER, NMSU, C. XU, J. MENENDEZ, J. KOUVETAKIS, ASU — Band gap engineering of Ge by controlling tensile strain and alloying with Si and Sn has attracted great interest. $\text{Ge}_{1-x-y}\text{Si}_x\text{Sn}_y$ ternary alloy with two compositional degrees of freedom allows decoupling lattice constant and electronic structures. Hence it is important to determine the temperature and compositional dependence of optical properties of these materials. The complex pseudodielectric functions of Ge films grown on Si(100) and GeSiSn grown on buffered Ge were measured using spectroscopic ellipsometry in the 0.76-6.6 eV energy range between 77-800 K to investigate the E_1 and $E_1 + \Delta_1$ critical point (CP) energies. CP energies and related parameters were obtained by analyzing the second-derivative $d^2\varepsilon/d^2\omega$ of the dielectric function. Our experimental results are in good agreement with the theoretically predicted E_1 CP energy shift of Ge on Si due to strain generated by thermal expansivity mismatch. We will discuss the compositional dependence of the E_1 and $E_1 + \Delta_1$ CP energies of GeSiSn alloys and effects of temperature on shifting CP energies.

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