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Electrical Properties of Hydrogen Transport VPE Grown n-CdTe Epilayers on ZnTe/GaAs

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Abstract: Electrical characterisation of n-CdTe epilayers grown by hydrogen transport vapour phase epitaxy (H_2T-VPE) on insulating ZnTe/(100)GaAs substrates through the temperature dependent Hall measurements is reported. Double-crystal X-ray diffraction assessments indicate the material high crystalline quality. Samples grown at temperatures, T_G < 650 °C were p-type, but appeared to be n-type for the temperatures above T_G > 650 °C. Hall measurements performed on n-type samples of different thicknesses grown at T_G = 764 °C showed room temperature carrier densities in the range of 10^{11}-10^{14} cm^{-3}. The electron density and Hall mobility characteristics may be in principle well explained with a two-level affective model. The model of scattering by lattice and ionised impurity were found to be limiting dominantly the room temperature electron mobility. For a \sim 22 μ m thick CdTe epilayers two donor levels were mainly estimated: The first, most abundant compensates partly 10^{18} cm^{-3} density of acceptors while the second with activation energy, E_d = 186 meV determines n-type electrical properties. A compensation ratio, 0.9997 holds for this epilayer. These could be possible formed through the diffusion of Ga atoms from GaAs into CdTe.

Key Words: CdTe; Electrical properties; Hall effect; H_2T-VPE; X-ray detectors.

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