$Cd_{1-y}Zn_yTe$ ternary alloys: from thermodynamic computations to stoichiometric growth conditions

Sara MODNI*[1], Jean Louis SANTAILLER[1], Timotée JOURNOT[1], Gilles PATRIARCHE[2], Vincent DESTEFANIS[3]

1 CEA Leti, LMP, Grenoble

2 CNRS, C2N, Palaiseau

3 Lynred, Grenoble

**Sara.modni@cea.fr*

Infrared sensors using II-VI materials are well known for various space applications. Their good electrical and optical properties allow high-resolution detection in all IR bands. The detection part of those sensors is composed of a $Cd_{1-y}Zn_yTe$ substrate (CZT) used to grow a lattice-matched layer of $Hg_{1-x}Cd_xTe$ (MCT) (cf. Fig 1). This work will focus on the CZT substrate, with the aim of studying the relation between the second phase defects of the $Cd_{1-y}Zn_yTe$, the intrinsic defects, and the growth conditions during single crystal elaboration. The understanding of the growth mechanisms may help to reduce these defects and thus improve the crystalline quality of the $Hg_{1-x}Cd_xTe$ active layer grown on top. The improvement of the quality of $Cd_{1-y}Zn_yTe$ and then of $Hg_{1-x}Cd_xTe$ materials will contribute to a better image quality of IR detectors.

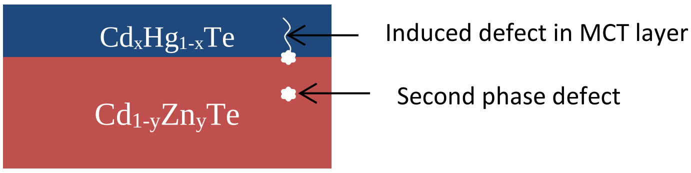

Figure 1 Sketch of the stack of the materials used to make the detection circuit.

The second phase defects (precipitates) are due to the deviation from the stoichiometry during the growth and cooling phases of crystallization. It is therefore important to understand the Cd-Zn-Te ternary phase diagram. The partial pressure of Cadmium, the growth and annealing temperatures and the initial composition of the feedstock are key parameters that must be controlled [1]. For this purpose, a thermodynamic study of the CdTe, ZnTe and $Cd_{1-y}Zn_yTe$ phase diagrams are investigated and will be presented. Now optimized control of partial pressure of components during the growth are tested and CZT second phase defects are measured with a set of characterization methods in order to evaluate the suggested growth conditions.

[1] Vapor pressure scanning of non-stoichiometry in $Cd_{0.9}Zn_{0.1}Te$ and $Cd_{0.85}Zn_{0.15}Te$. J.H. Greenberg, V.N. Guskov