Abstract

Presence of defects in semiconductor crystals is a problem for electronic and computer industry. This thesis presents a model for the grown-in point defects inside the indium antimonide crystals grown by the Czochralski technique. Our model is an extension of the ones used for silicon by distinguishing two types of interstitial defects.

Using the free energy argument, we derive our model for the dynamics of grown-in point defects by including the Fickian diffusion and recombination mechanisms, both are temperature dependent. This type of model is used for the first time to analyze grown-in point defects in indium antimonide crystals.

The model in both one and two spatial dimensions is solved using the finite difference method. The temperature solution and the advance of the melt-crystal interface is based on a recently derived perturbation model. Our main objective is to study the effect of thermal flux on the point defect patterns during and at the end of the growth process. Our numerical results show that the concentration of excessive point defects is positively correlated to the heat flux in the system.