

MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Science Results from Ground Based Research (4)

Author: Dr. Alexander Senchenkov
Research and Development Institute for Launch Complexes (NIISK), Russian Federation,
senchenkov@rambler.ru

Dr. Michael Fiederle
Freiburger Material Forschungszentrum, University of Freiburg (FMF), Germany,
michael.fiederle@fmf.uni-freiburg.de

Dr. Nikolai Kolesnikov
Institute of Solid State Physics, Russian Academy of Sciences (RAS), Russian Federation,
nikolai.n.kolesnikov@gmail.com

CZT CRYSTAL GROWTH BY THM IN MICROGRAVITY - PREPARATION OF EXPERIMENTS
FOR FOTON-M4 MISSION

Abstract

Spaceflight conditions provide unique opportunities for growing high-quality crystals. The majority of defects in the crystal are caused by the gravitational convection (macro- and micro-heterogeneity of properties, inclusions of second phase, etc.). Furthermore, the effect of the hydrostatic pressure leads to a close contact of the melt with the crucible walls, causing thermal stresses and formation of dislocations during solidification. Microgravity conditions are attractive especially for growing ternary and quaternary crystals with homogeneous properties, in particular, $\text{Cd}_{1-x}\text{Zn}_x\text{Te}$ crystals (CZT) with the content of ZnTe (x) of 8-15%. To study the effect of microgravity on the quality of the CZT crystals, two growth experiments are scheduled during the flight of the Russian automatic Foton-M4 spacecraft. This spacecraft is to be launched in 2014 for two months. Such long flight duration allows carrying out experiments that require long time, for instance, crystal growth from solution in the melt. Both CZT crystals would be grown by Travelling Heater Method (THM). The paper presents a description of the experiments, the results of mathematical simulation of crystal growth under terrestrial and space conditions, as well as some results of terrestrial experiments. As a result of on-ground preparation, the technological parameters of space experiments (process temperature, growth rate, etc.) were determined.