



Crystal Growth of Ternary Compound Semiconductors (GTS)

Crystallization of Cadmium-Telluride and Related Compounds



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Marshall Space Flight Center
Ground-based Research

NASA Objectives and Contributions:

- ◆ In crystal growth there is a need to understand the relation between processes in the fluid phase, both liquid and vapor, such as buoyancy driven convection, the incorporation of impurities, and defects in the resulting crystal
- ◆ Relation between fluid phase processes and the generation of defects in a grown crystal is an outstanding problem in materials growth
- ◆ Studies in microgravity will be compared with modeling and will be used to optimize ground-based experiments

Relevance/Impact:

- ◆ Crystal quality greatly influences important electronic properties in materials.
- ◆ Ternary compound semiconductors are of vital national interest as sensors in x-ray telescopes and for homeland security, and as substrate materials for infrared sensors.

Development Approach:

- ◆ Vapor transport and directional solidification will be investigated in CdZnTe.
- ◆ Phase equilibria and other thermodynamic properties are being studied on the ground.
- ◆ The high vapor pressures are ideal for enabling vapor transport, but can deleteriously affect stoichiometry, which results in precipitates.

LGF Low Gradient Furnace, MSL – Materials Science Laboratory
MRSS – Materials Science Research Rack

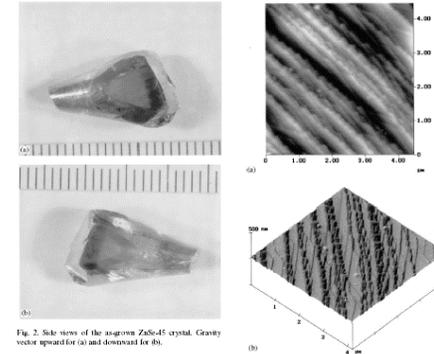


Fig. 2. Side views of the as-grown ZnSe-45 crystal. Gravity vector upward for (a) and downward for (b).

Crystal terraces on this (110) facet are separated by ~0.5 mm on the freshly grown surface and were measured between 20 and 60 nm height. Facets tend to align parallel to gravity vector.

ISS Resource Requirements

Accommodation (carrier)	LGF & MSL within MSRR
Upmass (kg) (w/o packing factor)	0.01 for samples 2 for SACAs
Volume (m ³) (w/o packing factor)	10e-8 for samples 0.005 for SACAs
Power (kw) (peak)	TBD
Crew Time (hrs) (installation/operations)	4
Autonomous Operation	TBD
Launch/Increment	TBD

Project Life Cycle Schedule

Milestones	SCR	RDR	PDR	CDR	VRR	Safety	FHA	Launch	Ops	Return	Final Report
Actual/ Baseline	10/98							03/11			