NASA-CR-204629

FINAL REPORT

Report for NAS8-40429

The primary responsibility of Dr. Scripa in response to the "**Statement of Work**" for NAS8-40429 consisted of participating as a co-investigator in the approved flight experiment "Crystal Growth of Selected II-VI Semiconducting Alloys by Directional Solidification." Responsibilities involved in this task included ground-based melt studies, compositional and microstructural characterization of the grown crystals, and participation in the continuing assessment of the program. Specifically, Dr. Scripa focused on could be removed from a crystal growth furnace in order to avoid shrinkage cavities in the crystal. To accomplish this objective, several modifications to the existing Bridgman facility at The University of Alabama at Birmingham were made. Included in these modifications were: upgrading the software for computer control of the furnace; design and construction of a computer controlled quench stage to enable effective and reproducible quenching of the HgZnTe samples.

The quench stage assembly consists of a moveable stage which is positioned under the bore of the Bridgman furnace. A positionable tripod base on the stage allows for accurate aligning of the ampoules with the furnace bore. The stage is driven by a microstepping motor for smooth motion and enhanced positioning resolution. When the stage is computer activated, it withdraws the HgZnTe ampoule completely into the furnace cold zone at the desired speed for quenching the crystal. In addition to modifying the hardware to effectively quench the HgZnTe crystals, experimentation was carried out to determine proper furnace zone temperatures to achieve the desired thermal profile. Two crystals were prepared in this study. They were grown in the Bridgman furnace and quenched at rates of 18 cm/min and 9 cm/min. After quenching, the microstructure and compositional uniformity were analyzed. Optical microscopy

was utilized to look at the quenched-in microstructure and Scanning Electron Microscopy (SEM) analysis was used for compositional analysis. Porosity, as related to quenching rates, was documented. Correlation was made between the rate of quench and the ability to avoid shrinkage cavities in the crystal.

Additionally, and in accordance with the "**Statement of Work**," nine HgZnTe ampoules were prepared and delivered to Marshall Space Flight Center for Flight Control Experiment Laboratory Testing. This was four ampoules more than called for in the Statement of Work. The DD 250 forms documenting delivery of these ampoules are attached.