FINAL REPORT for Contract No. NAS8-39877

Final Report for Period January 1,1994 to April 30,1997.

This is the Science-Advisor's Final Report on USML-2 Project entitled "The Study of Dopant Segregation Behavior During the Growth of GaAs in Microgravity". (Contract No. NAS8-38148)

The principal experimental objectives of this project have been realised.Several crystal growth runs have been performed on earth, and two crystal growth runs were performed at microgravity on USML-2.The space equipment performed flawlessly.

For USML-2,the two growth cartridges were equipped with interface demarcation electrodes so that the growth rate and interface shape could be determined for the entire growth period.In all cases the growth rate was consistent with the furnace translation rate. The interface shape was quite concave.We had hoped to achieve a shape that was nearly planar.

The dopant segragation has not as yet been determined.Jennifer Bly has examined many slices of the crystals by Secondary-Ion-Mass-Spectrometry(SIMS) at AFLWP,but the raw data has not been processed as yet.

A discouraging result was that the surface of the growing crystal was concave.We had hoped to get much closer to a planar interface condition.These results indicate that there was a significant radial temperature gradient in the growth capsule.In order to exploit fully the scientific product of this series of experiments ,another flight experiment would be necessary.Such an additional space-growth run would only be worthwhile if the growth-capsule were modified to reduce the radial temperature gradient.

These modifications would not require any changes in the CGF hardware.Some modeling is called for at this time,such as a finite element analysis,to reduce the radial gradient,to be followed by two or three earth based crystal growth runs to verify any reduction of the gradient.

Some posssible changes--change the temperature of the hot or the cold zone--change the location of the grrowth interface within the gradient zone--modify the PBN growth sleeve,etc.

A more nearly planar interface shape would markedly reduce the radial dopant-segregation and make the analysis more meaningful.A nearly planar interface would also make the contact angle with the crucible much more favorable,increasing the likelyhood of obtaining a single crystal throughout the length of the regrown ingot.The comparison between earth-grown and space-grown material would thus be more apparant.

James A. Kafalas

NASA
National Aeronautics and Space Administration

Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.

4. Title and Subtitle

The Study of Dopant Segregation Behavior during the Growth of GaAs in Microgravity

5. Report Date
April 22, 1997

6. Performing Organization Code

7. Author(s)

James A. Kafalas

8. Performing Organization Report No.

10. Work Unit No.

9. Performing Organization Name and Address

James A. Kafalas
Viable Systems, Inc.
99 West Street
P.O. Box 439, Medfield, Ma 02052

11. Contract or Grant No.
NAS8-39877

13. Type of Report and Period Covered
Bi-Monthly Technical
03/01/97 - 04/30/97

12. Sponsoring Agency Name and Address

NASA/MSFC

AL 35812

14. Sponsoring Agency Code

15. Supplementary Notes

Final report for the period 01/01/94 - 04/30/97

16. Abstract

Crystal growth experiment to be performed on USML-1.
Objective is to determine effect of microgravity growth on dopant segregation.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
Microgravity- Crystal Growth	Unclassified- Unlimited.

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of pages	22. Price
		1	

NASA FORM 1626 OCT 86