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# REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE September 1, 1984	3. REPORT TYPE AND DATES COVERED 7/1/83-7/31/84 Final Report
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4. TITLE AND SUBTITLE ULTRASTRUCTURAL PROCESSING OF CERAMICS, GLASSES AND COMPOSITES	5. FUNDING NUMBERS 61102F 2917/A2
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6. AUTHOR(S) Larry L. Hench	7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) University of Florida Dept of Materials Science and Engineering Gainesville, FL 32611	8. PERFORMING ORGANIZATION REPORT NUMBER AFOSR-TR-89-179A
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9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) AFOSR BLDG 410 BAFB DC 20332-6448	10. SPONSORING/MONITORING AGENCY REPORT NUMBER AFOSR-83-0287
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11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT unlimited	12b. DISTRIBUTION CODE
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13. ABSTRACT (Maximum 200 words)

**DTIC**  
**ELECTE**  
**S** JAN 05 1990 **D**  
**D** CS **D**

14. SUBJECT TERMS	15. NUMBER OF PAGES 3
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
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AD-A216 513

**AFOSR-TR. 89-1738**

**Scientific Report**

to

**United States Air Force  
Air Force Office of Scientific Research  
Building 410  
Bolling Air Force Base, DC 20332**

**Grant No. AFOSR-83-0287**

**ULTRASTRUCTURE PROCESSING OF CERAMICS, GLASSES AND COMPOSITES**

Submitted by

**Larry L. Hench, Professor  
Department of Materials Science and Engineering  
University of Florida  
Gainesville, FL 32611**

September 1, 1984

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A-1	

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## Introduction

→ The purpose of this \$100,000 grant was to purchase an Inductively Coupled Plasma (ICP) Chemical Analysis System, a Fourier Transform InfraRed Gas Cell Accessory, and other accessories for the characterization of chemically processed ceramics, glasses, and composites. (A W)\*

## Equipment Purchased

After review of various manufacturers of ICP equipment competitive bids were received (U of F Bid #B4-133) and the purchase was made from the Instrumentation Laboratory (IL) Corp., 2410 Park Central Blvd., Decatur, Georgia 30035. The amount was \$72,400.

Other major equipment items purchased to complement the ICP for chemical characterization were: DuPont Thermomechanical Analyzer, \$12,550; Pt crucible and cover from Johnson Matthey, \$4,212; miscellaneous laboratory accessories from Fisher Scientific and Instron Corp totalling \$5,838; and a FTIR Diffuse Reflection Stage Model 3-D and Vacuum Chamber for \$5,000 from Barnes Analytical, 652 Glenbrook Rd., P. O. Box 2190G, Stamford, Connecticut 06906.

## Research Projects

The above instruments have been used primarily on the Multi-Investigator Research Project "Ultrastructure Processing and Environmental Stability of Advanced Structural and Electronic Materials", Contract #F49629-83-C-0072.

The ICP has been used to analyze the starting metal organic constituents in our sol-gel research. We have been able to show ppb level of purity of the starting materials. We also have used the ICP in studying mechanisms of glass corrosion and environmental interactions.

The analytical accessories from DuPont, Johnson Matthey, Fisher and Instron have also been used to determine structural changes in the sol-gel materials and compare them with glasses and glass-ceramics made from standard glass-melting methods.

The FTIR stage has made it possible to follow the chemical structural changes occurring in the liquid reactions of sol-gels and during drying and densification.