**Title and Subtitle**: Final Report on ONR Grant "Solid State NMR Studies of Morphology and Orientation in Polymers"

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**Limitation of Abstract**: UNLIMITED
The Department of Defense (DOD) requires certain information to evaluate the effectiveness of the AASERT program. By accepting this Grant Modification, which bestows the AASERT funds, the Grantee agrees to provide the information requested below to the Government's technical point of contact by each annual anniversary of the AASERT award date.

1. Grantee identification data: (R & T and Grant numbers found on Page 1 of Grant)
   a. Texas A&M University
   b. N00014-91-J-1475
   c. 4132056
   d. Dr. James F. Haw
   e. From: 12/1/94 To: 11/30/95

   NOTE: Grant to which AASERT award is attached is referred to hereafter as "Parent Agreement."

2. Total funding of the Parent Agreement and the number of full-time equivalent graduate students (FTEGS) supported by the Parent Agreement during the 12-month period prior to the AASERT award date.
   a. Funding: $75,000
   b. Number FTEGS: 2

3. Total funding of the Parent Agreement and the number of FTEGS supported by the Parent Agreement during the current 12-month reporting period.
   a. Funding: $80,000
   b. Number FTEGS: 2.5

4. Total AASERT funding and the number of FTEGS and undergraduate students (UGS) supported by AASERT funds during the current 12-month reporting period.
   a. Funding: $84,864
   b. Number FTEGS: 1
   c. Number UGS: 84,864

VERIFICATION STATEMENT: I hereby verify that all students supported by the AASERT award are U.S. citizens.

_________________________    ________
Principal Investigator        Date
SOLID STATE NMR STUDIES OF MORPHOLOGY AND ORIENTATION IN POLYMERS

Prof. James F. Haw
Department of Chemistry
Texas A&M University
College Station, TX 77843

Nov 28, 1995

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Final Report for ONR Grant #N00014-91-J-1475

Summary

Our objective was to provide research training opportunities for graduate students in NMR characterization of polymers, in particular polymers for NLO applications. We collaborated with the Allcock group at Penn State and have a large paper in press in *Macromolecules* on polyphosphazene NLO polymers. The methodology was to use P-31 and C-13 MAS NMR to study in detail the temperature dependent main-chain and NLO side-group dynamics in two NLO polymers. We studied photochemical cross-linking in host polymer systems and verified the 2+2 mechanism that was central to the original proposal. This was first communicated in *Macromolecules*, and other work will be forthcoming.

Graduate Students Supported from the Grant

1. Tom Krawietz
2. David Murray
3. Tim Skloss
4. Dodi Heryadi
5. David Ferguson
6. Jinhau Zhang
7. Sharon Taylor-Myers
8. Nicholas Elbaum
9. Jeffrey White
10. Ali Kheir

Publications


Presentations

1. 35th ENC, Pacific Grove, CA., April 1994, "NMR Instrumentation for Probing Chemical Reactions"
2. Society for Applied Spectroscopy, Rice University, January 1994, "New Applications of NMR Spectroscopy"
3. ACS 49th Southwest Regional Meeting, Austin, TX., October 1993, "Characterization of Slow Chromophore Reorientation in Nonlinear Optical Polymers by 2-D NMR"
4. University of Delaware NMR Symposium, Newark, DE, June 1993, "NMR and the Academic-Industrial Interface"
5. NMR User's Association of Brazil 9th Conference, Angra dos Reis, Brazil, May 1993, "Solid State NMR of Materials"


8. Rohm and Haas, Bristol, PA, February 1993, "Characterizing Dynamics of Nonlinear Optical Polymers using Solid-State NMR." (Presented by Ms. Sharon A. Taylor-Myers)

9. Magnetic Resonance Imaging Short Course for Industry, Department of Chemical Engineering, Texas A&M University, November 1992, "Introduction to NMR"

10. Department of Chemistry, Purdue University, October 1992, "Future Directions in Analytical NMR"


12. Office of Naval Research Contractor's Meeting, Naval Research Laboratory, Isle of Palms, SC, April 1992, "NMR of NLO Polymers" (Presented by Ms. Sharon A. Taylor-Myers)

13. Sigma Xi Interdisciplinary Research Workshop, Texas A&M University, College Station, TX, April 1992, "Solid State NMR of Materials"


15. ACS 47th Southwest Regional Meeting, San Antonio, TX, October, 1991, "Characterization of Nonlinear Optical Polymers Using Solid-State NMR" (Presented by Ms. Sharon A. Taylor-Myers)


18. Magnetic Resonance Imaging Short Course for Industry, Department of Chemical Engineering, Texas A&M University, May, 1991, "Introduction to NMR"

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__________________________ 11/22/95
Principal Investigator Date