REPORT DOCUMENTATION PAGE

1. AGENCY USE ONLY (Leave blank)  

2. REPORT DATE  
26 September 1997

3. REPORT TYPE AND DATES COVERED  
Final Progress Report (Sept.1996-Sept.97)

4. TITLE AND SUBTITLE  
Polymeric Electrolytes via Silicon - Chlorine Nucleophilic Substitution Chemistry

5. FUNDING NUMBERS  
DA-20-96-045-0704

6. AUTHOR(S)  
K.B. Wagener, J.R. Reynolds and K.R. Brzezinska

7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(ES)  
University of Florida  
Gainesville, FL 32611

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)  
U.S. Army Research Office  
P.O. Box12211  
Research Triangle Park, NC 27709-2211

10. SPONSORING / MONITORING AGENCY REPORT NUMBER  
ARO 36 337.1-CH

11. SUPPLEMENTARY NOTES  
The views, opinions and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other documentation.

12a. DISTRIBUTION / AVAILABILITY STATEMENT  
Approved for public release; distribution unlimited.

13. ABSTRACT (Maximum 200 words)  
The project goals are the synthesis of new materials having the potential for use as ion-conducting membranes. We have been able to make rugged membrane structures from a polymer of interest by first casting the polymer on a surface then exposing it to UV irradiation. These procedure generates free standing membranes that are quite durable in themselves. The initial goal has been to investigate the use of unsaturated carbosilane monomer functionalized with an Si-Cl bond in the synthesis of new materials for use as ion-conducting membranes. We've spent most of our time devising the synthesis chemistry needed to create chlorosilane monomers substituted with appropriate nucleophiles. The nucleophiles employed thus far have been diethylene glycol methyl ether and the sodium salt of 3-hydroxy-1-propane-sulfonic acid.

DTIC QUALITY INSPECTED

14. SUBJECT TERMS  
chlorosilane, polymer, metathesis, polymeric electrolytes

15. NUMBER OF PAGES

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT

UNCLASSIFIED

18. SECURITY CLASSIFICATION OF THIS PAGE

UNCLASSIFIED

19. SECURITY CLASSIFICATION OF ABSTRACT

UNCLASSIFIED

20. LIMITATION OF ABSTRACT

UL

NSN 7540-01-280-5500

Enclosure 1

Standard Form 298 (Rev. 2-89)  
Prescribed by ANSI Std. 239-18  
298-102
FINAL PROGRESS REPORT
TWO COPIES REQUIRED

1. ARO PROPOSAL NUMBER: AMXRO-ICA 36337-CH

2. PERIOD COVERED BY REPORT: 30 September 1996 - 30 September 1997

3. TITLE OF PROPOSAL: Polymeric Electrolytes via Silicon-Chlorine Nucleophilic Substitution Chemistry.

4. CONTRACT OR GRANT NUMBER: DAAH04-96-1-0454

5. NAME OF INSTITUTION: University of Florida

6. AUTHORS OF REPORT: K.B. Wagener, J.R. Reynolds and K.R. Brzezinska

7. LIST OF MANUSCRIPTS SUBMITTED OR PROPOSED UNDER ARO SPONSORSHIP DURING THIS REPORTING PERIOD, INCLUDING JOURNAL REFERENCES: None

8. SCIENTIFIC PERSONNEL SUPPORTED BY THIS PROJECT AND DEGREES AWARDED DURING THIS PERIOD:
   K.R. Brzezinska, Postdoctoral Associate
   K. B. Wagener, Professor of Chemistry
   J.R. Reynolds, Professor of Chemistry

9. REPORTS OF INVENTIONS BY TITLE: None

K.B. Wagener
Department of Chemistry
University of Florida
Gainesville, FL 32611
Description of the research problem studied. Our work is related to the synthesis of new materials having the potential for use as ion-conducting membranes (Figure 1). These materials should be impermeable to methanol penetration or crossover; they should be able to transport protons with relative ease and they should have a high ion conductivity.

Summary of the most important results. The project goals are to investigate the use of unsaturated carbosilanes functionalized with a Si-Cl bond in the synthesis of new materials having the potential for use as ion-conducting membranes (Figure 1).

Figure 1. The synthesis of new materials having the potential for use as ion-conducting membranes.
We have been able to make rugged membrane structures from a polymer (I) by first casting the polymer on a surface then exposing it to UV irradiation. This procedure generates free standing membranes that are quite durable in themselves.

We've spent most of our time devising the synthesis chemistry needed to create chlorosilane monomers substituted with appropriate nucleophiles. The nucleophiles employed thus far have been diethylene glycol methyl ether and the sodium salt of 3-hydroxy-1-propane sulfonic acid. First the backbone monomer, dichlorodihexenylsilane (made for Doug Kiserow's elastomer project) was synthesized via hydrosilation chemistry. Nucleophilic substitution then was done on this monomer with the diethylene glycol methyl ether nucleophile (step 1, Figure 1). ADMET polymerization followed to give a highly viscous oil (step 2, Figure 1) and this oil was then converted into a membrane as described above (cast on surface, UV irradiation).

Nucleophilic substitution on the Si-Cl bond in the carbosilane monomer with sodium salt of 3-hydroxy-1-propane sulfonic acid produced a solid. This product was insoluble in organic solvents (toluene, chloroform) but soluble in DMF or DMSO. Substitution on the Si-Cl bond in the dichloro-carbosilane polymer with sodium salt of 3-hydroxy-1-propane sulfonic acid produced material insoluble in virtually every solvent system studied.

List of all publications and technical reports: None.

Scientific personnel supported by this project and degrees awarded during this period.

K.R. Brzezinska, Postdoctoral Associate
K.B. Wagener, Professor of Chemistry
J.R. Reynolds, Professor of Chemistry

Reports of invention by title. None.
Bibliography


