REPORT DOCUMENTATION PAGE

Form Approved OMB NO. 0704-0188

1. REPORT DATE (DD-MM-YYYY)	2. REPORT TYPE	3. DATES COVERED (From - To)
07-08-2019	Final Report	5-Jun-2018 - 31-May-2019

4. TITLE AND SUBTITLE
Final Report: Gel Permeation Chromatograph for Complex Polymer Composites

5a. CONTRACT NUMBER
W911NF-18-1-0197

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER
611103

6. AUTHORS

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAMES AND ADDRESSES
Massachusetts Institute of Technology (MIT
77 Massachusetts Avenue
NE18-901
Cambridge, MA 02139 -4307

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS (ES)
U.S. Army Research Office
P.O. Box 12211
Research Triangle Park, NC 27709-2211

10. SPONSOR/MONITOR'S ACRONYM(S)
ARO

11. SPONSOR/MONITOR'S REPORT NUMBER(S)
72109-CH-RIP.1

12. DISTRIBUTION AVAILIBILITY STATEMENT
Approved for public release; distribution is unlimited.

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

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	15. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Robert Macfarlane
UU	UU	UU	UU		19b. TELEPHONE NUMBER 617-715-2828

RPPR Final Report
as of 13-Jan-2020

Agency Code:

Proposal Number: 72109CHRIP **Agreement Number: W911NF-18-1-0197**
INVESTIGATOR(S):

Name: Robert J Macfarlane
Email: rmacfarl@mit.edu
Phone Number: 6177152828
Principal: Y

Organization: **Massachusetts Institute of Technology (MIT)**
Address: 77 Massachusetts Avenue, Cambridge, MA 021394307
Country: USA

DUNS Number: 001425594 EIN: 042103594
Report Date: 31-Aug-2019 Date Received: 07-Aug-2019
Final Report for Period Beginning 05-Jun-2018 and Ending 31-May-2019
Title: Gel Permeation Chromatograph for Complex Polymer Composites
Begin Performance Period: 05-Jun-2018 **End Performance Period:** 31-Jan-2020
Report Term: 0-Other

Submitted By: Robert Macfarlane Email: rmacfarl@mit.edu
Phone: (617) 715-2828

Distribution Statement: 1-Approved for public release; distribution is unlimited.

STEM Degrees: 1 **STEM Participants:** 10

Major Goals: This proposal outline the purchase of a Gel Permeation Chromatograph, to be used for characterizing polymers synthesized in the Macfarlane lab for DOD-relevant projects. This instrumentation was obtained to aid in the determination of molecular weight and dispersity of polymers to be used in the fabrication of composites with novel mechanical, optical, electrical, or coupled combinations of these properties. Instrumentation is housed and maintained in the Macfarlane lab, but of free use to other members of the local community.

Accomplishments: Instrumentation was purchased and is currently operational. Use of the instrument has been vital in multiple research projects, and enabled significant advances that would not have been otherwise possible. Additionally, instrumentation has been made available to other groups at MIT for any polymer characterization they find helpful or necessary.

Training Opportunities: Multiple students in the Macfarlane lab and other labs at MIT are now familiar with the operation and maintenance of the state-of-the-art polymer characterization instrumentation; this will help them immensely in their future careers.

RPPR Final Report
as of 13-Jan-2020

Results Dissemination: Research using data obtained with the GPC instrumentation is now included in multiple manuscripts, including:

Y. Wang et al, "Multi-Stimuli Responsive Nanocomposite Tectons for Pathway Dependent Self-Assembly and Acceleration of Covalent Bond Formation", J. Am. Chem. Soc. 2019, DOI: 10.1021/jacs.9b06695

J. M. Kubiak et al, "Forming Covalent Crosslinks between Polymer Grafted Nanoparticles as a Route to Highly Filled and Mechanically Robust Nanocomposites", Advanced Functional Materials 2019, accepted (DOI pending)

P. J. Santos et al, "Dictating Nanoparticle Assembly via Systems-Level Control of Molecular Multivalency", J. Am Chem. Soc. 2019, (under revision)

F. Jia et al, "Design and Synthesis of a Polymer Hydrogel via Bottlebrush Polymers", (under review)

P. J. Santos et al, "Reinforcing Supramolecular Bonding with Magnetic Dipole Inter-actions to Assemble Dynamic Nanoparticle Superlattices", manuscript in preparation

M. Lee et al, "Assembly of Particles in High Polymer Content Solutions Enhances Thermodynamic Stability", manuscript in preparation

Honors and Awards: The PI was awarded the following honors:

3M Non-tenured Faculty Award
Paul M. Cook Assistant Professorship Chair

Protocol Activity Status:

Technology Transfer: Nothing to Report

PARTICIPANTS:

Participant Type: PD/PI
Participant: Robert John Macfarlane
Person Months Worked: 1.00
Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Funding Support:

Nothing to report in this PDF.