REPORT DOCUMENTATION PAGE

Form Approved OMB NO. 0704-0188

1. REPORT DATE (DD-MM-YYYY)	2. REPORT TYPE	3. DATES COVERED (From - To)
16-02-2023	Final Report	1-Aug-2022 - 1-Dec-2022

4. TITLE AND SUBTITLE
Final Report: Twenty Third International Symposium on Molten Salts and Ionic Liquids (MSIL23) at the Fall 2022 Electrochemical Society Meeting

5a. CONTRACT NUMBER
W911NF-22-1-0065

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER
611102

6. AUTHORS

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAMES AND ADDRESSES
The Electrochemical Society
65 South Main Street
Building D
Pennington, NJ 08534 -2839

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)
80233-ES-CF.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			William Reichert
UU	UU	UU	UU		19b. TELEPHONE NUMBER 251-460-6628

RPPR Final Report
as of 20-Mar-2023

Agency Code: 21XD

Proposal Number: 80233ESCF **Agreement Number: W911NF-22-1-0065**
INVESTIGATOR(S):

Name: William Matthew Reichert
Email: reichert@southalabama.edu
Phone Number: 2514606628
Principal: Y

Organization: **The Electrochemical Society**
Address: 65 South Main Street, Pennington, NJ 085342839
Country: USA
DUNS Number: 067386755 EIN: 131771269
Report Date: 01-Mar-2023 Date Received: 16-Feb-2023
Final Report for Period Beginning 01-Aug-2022 and Ending 01-Dec-2022
Title: Twenty Third International Symposium on Molten Salts and Ionic Liquids (MSIL23) at the Fall 2022 Electrochemical Society Meeting
Begin Performance Period: 01-Aug-2022 **End Performance Period:** 01-Dec-2022
Report Term: 0-Other
Submitted By: Kellie Gilbert Email: development@electrochem.org
Phone: (609) 737-1902101
Distribution Statement: 1-Approved for public release; distribution is unlimited.

STEM Degrees: **STEM Participants:**

Major Goals: The Twenty Third International Symposium on Molten Salts and Ionic Liquids is part of the 242nd International Meeting of the Electrochemical Society held in Atlanta, GA, October 9-14, 2022. For nearly four decades it has served as the premier forum for the interchange of ideas between molten salt and ionic liquids researchers from around the world. The Molten Salts and Ionic Liquids symposium was initiated in 1976, and has generally been held every other year in conjunction with The Electrochemical Society international meetings; however, twice in its history the symposium has been held at three-year intervals. Using recent history as an indicator, we expect roughly 100 presentations (oral and posters) representing investigators from 18 countries. We expect the oral and poster presentations will originate from among a diverse collection of international scholars, including USA, Japan, France, Germany, China, Canada, Norway, Belgium, United Kingdom, Italy, South Korea, Estonia, Russia, and Ukraine. In addition to the body of work discussed at the symposiums, publication of the symposium proceedings summarizes and expands on each presentation. The volume is published by The Electrochemical Society through its definitive proceedings series on numerous topics. The Electrochemical Society requests that a minimum of 80% of symposium presentations be included in the volume before publication is allowed; therefore, the volume provides a comprehensive overview of each published symposium. The Symposium on Molten Salts and its proceedings showcase the state-of-the-art in molten salt research, which spans a wide range of scientific basic research. The sampling of topics below illustrates the diversity of the most recent past symposium.

This symposium will provide an international and interdisciplinary forum to present the latest research on systems involving molten salts and ionic liquids. Papers on basic and applied research in all areas of chemistry, engineering, electrochemical systems, and physics related to molten salts and ionic liquids are solicited. The topics will include but are not restricted to: 1) Power & Energy Applications (e.g. batteries, fuel cells, semiconductors, photovoltaics, and phase change energy storage); 2) Rare Earth and Nuclear chemistry (e.g. lanthanides, actinides, radioisotopes, nuclear reprocessing); 3) Electrodeposition (e.g. deposition of alloys, characterization of electroactive species, and surface characterization); 4) Reactions (e.g. catalysis, synthesis, oligomerizations, and polymerizations); 5) Separations (e.g. selective extractions and biphasic systems); 6) Solute and Solvent Properties (e.g. structural investigations, thermal properties, dynamics, and stability of ionic liquids and molten salts); 7) Biomass applications (e.g. dissolution, modification, and/or reactions utilizing biomass), 8) Materials (e.g. polymer blends, additive manufacturing, active coatings, and corrosion studies); 9) New ionic liquids and molten salt mixtures (e.g. liquid clathrates, binary and ternary melts, and task specific ionic liquids); 10) Deep eutectic solvents (e.g., synthesis, properties, and applications). In addition, papers are encouraged for a special session to honor the 2022 recipient of the Max Bredig Award, Prof. Tom Welton.

RPPR Final Report
as of 20-Mar-2023

Accomplishments: MSIL23 was the first in person Ionic Liquids symposium at ECS since 2018, because the MSIL22 (in 2020) was held virtually. The event was overwhelmingly successful, featuring 40 oral and 15 poster presentations, representing investigators from more than 15 countries across 4 continents. The Max Bredig Award associated with the symposium was granted to Professor Tom Welton, from Imperial College London.

Training Opportunities: Nothing to Report

Results Dissemination: Proceedings vol 109, no 14, of ECS Transactions was published based on this meeting that included 27 peer reviewed conference papers. Also, a Special Issue of the Journal of the Electrochemical Society is being assembled for publication in summer 2023. The Call for Papers, Proceedings Preface and Table of Contents are attached.

Honors and Awards: Nothing to Report

Protocol Activity Status:

Technology Transfer: Nothing to Report

PARTICIPANTS:

Participant Type: PD/PI
Participant: William Reichert
Person Months Worked: 2.00
Project Contribution:
National Academy Member: N

Funding Support:

Partners

,

I certify that the information in the report is complete and accurate:
Signature: Kellie Gilbert
Signature Date: 2/16/23 8:16PM

TO: Dr. Robert A. Mantz, Program Manager

FROM: Dr. W. Matthew Reichert, Prof. of Chemistry, University of South Alabama

RE: Final Report on "Twenty Third International Symposium on Molten Salts and Ionic Liquids" (ARO Grant #W911NF-22-1-0065)

DATE: February 15, 2023

Summary The 23rd International Symposium on Molten Salts and Ionic Liquids was held as part of a joint meeting of the 242nd National Electrochemical Society (ECS). Funds were requested and awarded from the Army Research Office (ARO) in the amount of $30,000 to supplement travel expenses for speakers. These funds were specifically directed to support travel and registration fees for symposium invited speakers and some junior faculty.

Relevance to ARO

The Symposium on Molten Salts and Ionic Liquids covers a wide range of topics of importance to the United States Army, including electrochemical power (e.g., battery and fuel cells), solid state materials (e.g., corrosion resistant alloys and semiconductors), molten salt promoted corrosion phenomena (e.g., high temperature turbine corrosion), separations (e.g., toxic gas sensing and removal), nuclear fuel reprocessing, and bio-materials and systems (e.g,, biological reactions, bio-catalysis, and bio- nanocomposites). Molten salts and ionic liquids offer the potential for unique solvent environments for biological reactions and biocatalysis. The high ionic strength and non-complexing nature of many of these systems provide unique opportunity for novel biological reactions and bio-based materials. The guiding philosophy for the symposia at the National Electrochemical Society meetings, including the Symposium on Molten Salts and Ionic Liquids, is based on the stated objectives of The Electrochemical Society which are to advance the theory and practice of electrochemistry, solid state sciences, and allied subjects; to encourage the research and dissemination of knowledge in these fields; and to promote the education of fundamental and applied scientists and engineers in these fields.

Accomplishments

MSIL23 was the first in person Ionic Liquids symposium at ECS since 2018, because the MSIL22 (in 2020) was held virtually. The event was overwhelmingly successful, featuring 40 oral and 15 poster presentations, representing investigators from more than 15 countries across 4 continents. The Max Bredig Award associated with the symposium was granted to Professor Tom Welton, from Imperial College London. Proceedings vol 109, no 14, of ECS Transactions was published based on this meeting that included 27 peer reviewed conference papers. Also, a Special Issue of the Journal of the Electrochemical Society is being assembled for publication in summer 2023. The Call for Papers, Proceedings Preface and Table of Contents are attached.

CALL FOR PAPERS
Molten Salts and Ionic Liquids 23

This symposium will provide an international and interdisciplinary forum to present the latest research on systems involving molten salts and ionic liquids. Papers on basic and applied research in all areas of chemistry, engineering, electrochemical systems, and physics related to molten salts and ionic liquids are solicited. The topics will include but are not restricted to: 1) Power & Energy Applications (e.g. batteries, fuel cells, semiconductors, photovoltaics, and phase change energy storage); 2) Rare Earth and Nuclear chemistry (e.g. lanthanides, actinides, radioisotopes, nuclear reprocessing); 3) Electrodeposition (e.g. deposition of alloys, characterization of electroactive species, and surface characterization); 4) Reactions (e.g. catalysis, synthesis, oligomerizations, and polymerizations); 5) Separations (e.g. selective extractions and biphasic systems); 6) Solute and Solvent Properties (e.g. structural investigations, thermal properties, dynamics, and stability of ionic liquids and molten salts); 7) Biomass applications (e.g. dissolution, modification, and/or reactions utilizing biomass), 8) Materials (e.g. polymer blends, additive manufacturing, active coatings, and corrosion studies); 9) New ionic liquids and molten salt mixtures (e.g. liquid clathrates, binary and ternary melts, and task specific ionic liquids); 10) Deep eutectic solvents (e.g., synthesis, properties, and applications). In addition, papers are encouraged for a special session to honor the 2022 recipient of the Max Bredig Award, Prof. Tom Welton.

Keynote lectures will be presented by invited speakers. A poster session will be planned. Student participation is highly encouraged, and it is anticipated that some funds will be available for student and young scientist support.

An issue of ECS Transactions will be published "AT" the meeting. All authors will need to submit their manuscripts by July 01, 2022. All manuscripts will be submitted online, and must be in either MS Word or PDF format. Authors are expected to use the official ECS Transaction template.

Abstracts should be submitted electronically to the ECS Headquarters Office using the Online Abstracts Submission website. A template is available on the website. Suggestions and inquiries should be sent to the Symposium Organizers:

D. P. Durkin, United States Naval Academy, email: durkin@usna.edu
P. C. Trulove, United States Naval Academy, email: trulove@usna.edu
A. Bund, TU Ilmenau, email: Andreas.Bund@tu-ilmenau.de
A. Ispas, TU Ilmenau, email: Adriana.Ispas@tu-ilmenau.de
V. Di Noto, University of Padova, email: vito.dinoto@unipd.it
W. M. Reichert, University of South Alabama, email: reichert@southalabama.edu
R. A. Mantz; Army Research Office, email: robert.a.mantz.civ@mail.mil
H. C. De Long, Army Research Office, email: hugh.c.delong.civ@mail.mil
T. Tsuda, Osaka University, email: ttsuda@chem.eng.osaka-u.ac.jp
M. Ueda, Hokkaido University, email: mikito@eng.hokudai.ac.jp

Molten Salts and Ionic Liquids 23 (MSIL-23)

Editors:

D. Durkin

P. Trulove

A. Bund

A. Ispas

V. Di Noto

W. M. Reichert

R. Mantz

H. De Long

T. Tsuda

M. Ueda

Sponsoring Divisions:

- Physical and Analytical Electrochemistry
- Electrodeposition
- Energy Technology

Published by

The Electrochemical Society

65 South Main Street, Building D

Pennington, NJ 08534-2839, USA

tel 609 737 1902

fax 609 737 2743

www.electrochem.org

ECS Transactions™

Vol. 109, No. 14

Published by:

The Electrochemical Society
65 South Main Street
Pennington, New Jersey 08534-2839, USA

Telephone 609.737.1902
Fax 609.737.2743
e-mail: ecs@electrochem.org
Web: www.electrochem.org

ISSN 1938-6737 (online)

ISBN 978-1-60768-966-9 (PDF)

Printed in the United States of America.

Preface

The papers included in this issue of *ECS Transactions* were originally presented in the symposium "Molten Salts and Ionic Liquids 23 (MSIL-23)", held during the 242nd meeting of The Electrochemical Society, in Atlanta, GA, USA, from October 9-13, 2022.

***ECS Transactions*, Volume 109, Issue 14**
Molten Salts and Ionic Liquids 23 (MSIL-23)

Table of Contents

Facts about ECS

The Electrochemical Society (ECS) is an international, nonprofit, scientific, educational organization advancing the theory and practice of electrochemistry and solid state science and technology, and allied subjects. The Society was founded in Philadelphia in 1902 and incorporated in 1930. There are currently over 8,000 members from around the globe representing 13 technical division and 23 geographical sections and a growing student membership program with over 100 student chapters. The Society is also supported by more than 2,000 corporations, government agencies, and academic institutions through institutional membership, corporate programs, and subscriptions.

The technical activities of the Society are carried on by divisions. Sections of the Society host symposia, programs, and events focused on their respective geographic regions. Major international meetings of the Society are held in the spring and fall of each year. At these meetings, the divisions and partnered organizations hold general sessions and sponsor symposia on specialized subjects.

The Society has an active publications program that includes the following:

Journal of The Electrochemical Society — (JES) is the flagship journal of The Electrochemical Society and the oldest peer-reviewed journal in its field. Since its founding in 1902, JES has evolved into one of the most highly cited and prestigious journals in electrochemistry and materials science with a cited half-life of greater than 10 years.

ECS Journal of Solid State Science and Technology — (JSS) is a peer-reviewed journal covering fundamental and applied areas of solid state science and technology, including experimental and theoretical aspects of the chemistry, and physics of materials and devices.

ECS Transactions (ECST) — is the official conference proceedings publication of The Electrochemistry Society — a high-quality venue for authors and an excellent resource for researchers. ECST offers the full-text content of proceedings from ECS meetings and ECS sponsored conferences.

The Electrochemical Society Interface — Interface is an authoritative yet accessible publication for those in the field of solid state and electrochemical science and technology. Published quarterly, this full-color magazine contains technical articles about the latest developments in the field, and presents news and information about the Society.

ECS Books Series — ECS books and monographs provide authoritative, detailed accounts of specific topics in electrochemistry and solid state science and technology. These titles are sponsored by ECS and published in cooperation with noted publishers such as John A. Wiley & Sons.

For more information on these publications and other Society activities, visit the ECS website:

www.electrochem.org