RMW10

The 10th Workshop on Reactive Metal Processing
March 20 (Fri.) - 21 (Sat.), 2015 @ MIT
Cambridge, Massachusetts, USA

Organizers
Donald R. Sadoway, Massachusetts Institute of Technology
Toru H. Okabe, IIS, The University of Tokyo
Antoine Allanore, Massachusetts Institute of Technology

Program Coordinators
Katsuhiro Nose, The University of Tokyo (currently at MIT)
Jungshin Kang, The University of Tokyo (currently at KIGAM)

http://www.okabe.iis.u-tokyo.ac.jp/core-to-core/rmw
The 10th Workshop on Reactive Metal Processing
March 20 (Friday) - March 21 (Saturday), 2015, MIT, Cambridge, MA

Time:
- 1st day: on March 20 (9:00 - 17:40 and Banquet in 18:30)
- 2nd day: on March 21 (9:00 - 12:20)
  Refreshments will be served around 8:30 AM at the Grier room in both days.

Venue:
- **Grier Room for Workshop (Building 34, Room 401)** (see page 12)
  Poster session is held at the Grier Room on March 20, 2015.
- **MIT Museum for Banquet** (see page 12 or http://web.mit.edu/museum)

Organizers:
  **Prof. Donald R. Sadoway**, *Massachusetts Institute of Technology*
  **Prof. Toru H. Okabe**, *IIS, The University of Tokyo*
  **Prof. Antoine Allanore**, *Massachusetts Institute of Technology*

Program Coordinators:
  **Dr. Katsuhiro Nose**, *The University of Tokyo (currently at MIT)*
  **Dr. Jungshin Kang**, *The University of Tokyo (currently at KIGAM)*

Sponsors:
A part of the workshop is financially supported by Strategic Young Researcher Overseas Visits Program for Accelerating Brain Circulation by JSPS (P.I.: Prof. T.H. Okabe), The Rare Metal Research Workshop (RC-40: directed by Prof. T.H. Okabe), one of the Special Research Group organized by the Foundation for the Promotion of Industrial Science (FPIS), SEIKEN Symposium No. 80 by the Foundation for the Promotion of Industrial Science (FPIS), and Grant-in-Aid for Scientific Research (S) by JSPS.

Registration Fee:
$200 / person (including banquet)
NOTICE: Please prepare to pay the registration fee in cash!

Contact Address:
  **Jungshin Kang**, *Institute of Industrial Science, The University of Tokyo*
  E-mail: jskang@iis.u-tokyo.ac.jp    Phone: +81-3-5652-6314
Workshop Program

Day 1

Morning, March 20 (Friday), 2015 @ Grier Room

8:30 – 9:00  Coffee & Breakfast Service
9:00 – 9:10  Opening Remarks
Prof. Donald R. Sadoway, Massachusetts Institute of Technology
Prof. Toru H. Okabe, IIS, The University of Tokyo

Session Chair: Prof. Toshiyuki Nohira
9:10 – 9:40  “Waste to energy conversion”
Uday B. Pal1 and Soobhankar Pati2
1Division of Materials Science and Engineering, Boston University
2Indian Institutes of Technology (IIT) Bhubaneshwar

9:40 – 10:10 “Thermodynamic treatment of particulates sintering processes”
Yiannis G. Kipouros1, Paul Burke2, George Jarjoura2, and Georges J. Kipouros2
1McMaster University
2University of Saskatchewan

10:10 – 10:20 Break

Session Chair: Prof. Tetsuya Uda
10:20 – 10:50 “Novel molten carbonate electrolysis for a low-carbon future”
Dihua Wang1
1Wuhan University

10:50 – 11:20 “Anode processes during electrowinning of aluminium”
Geir Martin Haarberg1, Henrik Åsheim1, Rauan Meirbekova1,2, Guðrún Sævarsdóttir2, and Thor Anders Aarhaug3
1Department of Materials Science and Engineering, Norwegian University of Science and Technology
2School of Science and Engineering, Reykjavik University
3SINTEF Materials and Chemistry

11:20 – 11:50 “Electrolytic nature of molten sulfides electrolyte”
Samira Sokhanvaran1, Sangkwon Lee1, Guillaume Lambotte1, and Antoine Allanore1
1Department of Materials Science and Engineering, MIT

11:50 – 13:00 Lunch
Afternoon, March 20 (Friday), 2015
@ Grier Room

Session Chair: *Prof. Georges J. Kipouros*

**13:00 – 13:30**

“Electrodeposition of solar grade Si film on graphite in molten CaCl₂”

Huayi Yin¹, Donald R. Sadoway¹, and Allen Bard²

¹Massachusetts Institute of Technology
²University of Texas at Austin

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**13:30 – 13:55**

“Fundamental study on new recycling technology for Ti metal scraps”

Yu-ki Taninouchi¹, Yuki Hamanaka¹², and Toru H. Okabe¹

¹Institute of Industrial Science, The University of Tokyo
²Department of Materials Engineering, The University of Tokyo

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**13:55 – 14:10**

Break

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Session Chair: *Prof. Antoine Allanore*

**14:10 – 14:40**

“Sodium secondary batteries with amide ionic liquids”

Toshiyuki Nohira¹², Rika Hagiwara², Kazuhiko Matsumoto², Changsheng Ding², Chih-Yao Chen², Takayuki Yamamoto², Koma Numata³, Atsushi Fukunaga³, Shoichiro Sakai³, and Koji Nitta³

¹Institute of Advanced Energy, Kyoto University
²Graduate School of Energy Science, Kyoto University
³Sumitomo Electric Industries, Ltd.

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**14:40 – 15:10**

“Screening of effective ionic liquid for extraction of rare earth elements”

Etsuro Shibata¹, Mariusz Grabda¹, Mrutyunjay Panigrahi¹, Dmytro Kozak¹, and Takashi Nakamura¹

¹Institute of Multidisciplinary Research for Advanced Materials (IMRAM), Tohoku University

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**15:10 – 15:40**

Photo & Break

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Session Chair: *Dr. Jungshin Kang*

**15:40 – 16:40**

3-min short presentation by poster presenters

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**16:40 – 17:40**

Poster Session

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**18:30 –**

Banquet @ MIT Museum
Day 2

Morning, March 21 (Saturday), 2015  @ Grier room

8:30 –  9:00  Coffee & Breakfast Service
9:00 –  9:10  Opening Remarks

Prof. Antoine Allanore, Massachusetts Institute of Technology

Session Chair: Prof. Geir Martin Haarberg

9:10 –  9:40  “Quantum beam technology: catalytic materials prepared by ion beam irradiation for electrochemical device applications”

Tetsuya Yamaki1, Sho Kato2, Tetsuya Kimata2, Shunya Yamamoto1, Teruyuki Hakoda1, Tomohiro Kobayashi3, Akihiro Suzuki2, and Takayuki Terai2

1Quantum Beam Science Center, Japan Atomic Energy Agency (JAEA)
2Department of Nuclear Engineering and Management, The University of Tokyo
3Atomic Physics Laboratory, RIKEN

9:40 – 10:10  “High temperature electrolysis of REs and relevance for RE's recycling”

Ana Maria Martinez1 and Egil Skybakmoen1

1SINTEF Materials and Chemistry

10:10 – 10:20 Break

Session Chair: Dr. Katsuhiro Nose

10:20 – 10:45  “Recovery of cobalt from aqueous solution by utilizing gel precipitation and solvent extraction”

Sakae Shirayama1 and Tetsuya Uda1

1Department of Materials Science and Engineering, Kyoto University

10:45 – 11:10  “New smelting process of titanium using liquid bismuth”

Akihiro Kishimoto1, Kazuki Tsuchihashi1, and Tetsuya Uda1

1Department of Materials Science and Engineering, Kyoto University

11:10 – 11:15 Information for the Next RMW

Prof. Donald R. Sadoway, Massachusetts Institute of Technology

11:15 – 11:20 Closing Remarks

Prof. Donald R. Sadoway, Massachusetts Institute of Technology

11:20 – Laboratory Tour (for applicants)
1. “Electrodeposition mechanism of titanium in NaCl-KCl”
   Yuuki Yamada¹, Akihiro Kishimoto¹, and Tetsuya Uda¹
   ¹Department of Materials Science and Engineering, Kyoto University

2. “Electrolytic process for SiO₂ reduction using liquid Zn cathode in molten CaCl₂”
   Takeyuki Shimao¹, Xiao Yang²,³, Kouji Yasuda¹,², Toshiyuki Nohira²,³, Rika Hagiwara¹,
   Koki Ichitsubo⁴, Kenta Masuda⁵, and Takayuki Homma³,⁶
   ¹Graduate School of Energy Science, Kyoto University
   ²Institute of Advanced Energy, Kyoto University
   ³JST-CREST, Japan
   ⁴Environmental, Safety, and Health Organization, Kyoto University
   ⁵R&D Center, Taiheiyo Cement Corporation
   ⁶Faculty of Science and Engineering, Waseda University

3. “Electrodeposition of crystalline Si films utilizing water-soluble KF-KCl molten salts and
   SiCl₄ as a Si source”
   Kazuma Maeda¹, Kouji Yasuda¹,², Toshiyuki Nohira³,⁴, Rika Hagiwara¹,
   and Takayuki Homma⁴,⁵
   ¹Graduate School of Energy Science, Kyoto University
   ²Environment, Safety, and Health Organization, Kyoto University
   ³Institute of Advanced Energy, Kyoto University
   ⁴JST-CREST, Japan
   ⁵Faculty of Science and Engineering, Waseda University

4. “Thermodynamic properties of tellurium in molten steel”
   Shun Ueda¹ and Kazuki Morita¹
   ¹Department of Materials Engineering, The University of Tokyo

5. “Development of new recovery process for rhenium from nickel-base superalloy scraps”
   Ryohei Yagi¹,² and Toru H. Okabe²
   ¹Department of Materials Engineering, The University of Tokyo
   ²Institute of Industrial Science, The University of Tokyo

6. “Development of new technique for concentrating and separating platinum group metals”
   Tetsuo Watanabe¹, Yu-ki Taninouchi², and Toru H. Okabe²
   ¹Department of Applied Chemistry, Kogakuin University
   ²Institute of Industrial Science, The University of Tokyo
Yuki Hamanaka1,2, Yu-ki Taninouchi2, and Toru H. Okabe2
1Department of Materials Engineering, The University of Tokyo
2Institute of Industrial Science, The University of Tokyo

8. “A laboratory study of partial anode effects during aluminium electrolysis”
Henrik Åsheim1, Ole S. Kjos2, Espen Sandnes1,3, Thor Anders Aarhaug2, Asbjørn Solheim2, and
Geir Martin Haarberg1
1Department of Materials Science and Engineering, NTNU
2SINTEF Materials and Chemistry
3Primary Metal Technology, Hydro Aluminium ASA

Rauan Meirbekova1,2, Geir Martin Haarberg1, Jomar Thonstad1, Arne Petter Ratvik3,
Ole S. Kjos2, Thor Anders Aahaug2, and Guðrún Sævarsdóttir2,3
1Department of Materials Science and Engineering, NTNU
2Reykjavik University
3SINTEF Materials and Chemistry

10. “Extraction of potassium by electrolysis from molten K-feldspar at high temperature for
fertilizer applications”
Carole Gadois1 and Antoine Allanore1
1Department of Materials Science and Engineering, MIT

Davide Ciceri1, Carole Gadois1, Sonja Postak1, and Antoine Allanore1
1Department of Materials Science and Engineering, MIT

12. “Fundamental study on vaporization behavior of molten sulfides for molten sulfide
electrolysis”
Katsuhiro Nose1,2 and Antoine Allanore1
1Department of Materials Science and Engineering, MIT
2Institute of Industrial Science, The University of Tokyo

13. “Ultra high temperature rare earth metal extraction by electrolysis”
Bradley R. Nakanishi1, Guillaume Lambotte1, and Antoine Allanore1
1Department of Materials Science and Engineering, MIT

Mary Elizabeth Wagner1, Sangkwon Lee1, and Antoine Allanore1
1Department of Materials Science and Engineering, MIT
15. “In situ measurements of current density for a galvanically coupled electrode”
    Brian Chmielowiec\textsuperscript{1} and Antoine Allanore\textsuperscript{1}
    \textsuperscript{1}Department of Materials Science and Engineering, MIT

16. “Porous carbon anodes for supply of methane during electrowinning of aluminium”
    Babak Khalaghi\textsuperscript{1}, Tommy Mokkelbost\textsuperscript{2}, Ole Kjos\textsuperscript{2}, Henrik Gudbrandsen\textsuperscript{2}, and
    Geir Martin Haarberg\textsuperscript{1}
    \textsuperscript{1}Department of Materials Science and Engineering, NTNU
    \textsuperscript{2}SINTEF Materials and Chemistry

17. “Introduction of the recycling of spent automotive and petrochemical catalysts in Tanaka Precious Metal”
    Akihiko Okuda\textsuperscript{1} and Tomoko Yanagisawa\textsuperscript{1}
    \textsuperscript{1}Tanaka Kikinzoku Kogyo K.K., Tanaka Holdings Co., Ltd.
History of RMW

2006  The 1st Workshop on Reactive Metal Processing (RMW1)  
March 17 (Fri.) - March 19 (Sat.), Cambridge, MIT  

2006  The 2nd Workshop on Reactive Metal Processing (RMW2)  
November 16 (Thurs.) - November 17 (Fri.), Tokyo, The University of Tokyo  

2007  The 3rd Workshop on Reactive Metal Processing (RMW3)  
March 2 (Fri.) - March 3 (Sat.), Cambridge, MIT  

2008  The 4th Workshop on Reactive Metal Processing (RMW4)  
March 14 (Fri.) - March 15 (Sat.), Cambridge, MIT  

2010  The 5th Workshop on Reactive Metal Processing (RMW5)  
February 18 (Thurs.) - February 19 (Fri.), Seattle, Red Lion Hotel on 5th Avenue  

2011  The 6th Workshop on Reactive Metal Processing (RMW6)  
March 4 (Fri.) - March 5 (Sat.), Pasadena, Caltech  

2012  The 7th Workshop on Reactive Metal Processing (RMW7)  
March 16 (Fri.) - March 17 (Sat.), Cambridge, MIT  

2013  The 8th Workshop on Reactive Metal Processing (RMW8)  
March 8 (Fri.) - March 9 (Sat.), Cambridge, MIT  

2014  The 9th Workshop on Reactive Metal Processing (RMW9)  
February 21 (Fri.) - February 22 (Sat.), Pasadena, Caltech
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<thead>
<tr>
<th>Name</th>
<th>Position/Title</th>
<th>Institution</th>
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<tbody>
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<td>INFINIUM, Inc.</td>
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<tr>
<td>Akihiro Sato</td>
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Announcement for Next Workshop

RMW11
The 11th Workshop on Reactive Metal Processing

February 19 (Fri) – 20 (Sat), 2016 @ MIT, Cambridge
(After TMS 2016, February 14 – 18, 2016 @ Nashville, Tennessee)

Organizers
Donald R. Sadoway, Massachusetts Institute of Technology
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Antoine Allanore, Massachusetts Institute of Technology

Program Coordinators
Yu-ki Taninouchi, IIS, the University of Tokyo
Sakae Shirayama, The University of Tokyo

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