

RMW7

The 7th Workshop on Reactive Metal Processing

March 16(Fri.) - March 17(Sat.), 2012 @ MIT
Cambridge, MA

Organizers

Donald R. Sadoway, *Massachusetts Institute of Technology*

Toru H. Okabe, *IIS, the University of Tokyo*

Program Coordinators

Katsuhiro Nose, *IIS, the University of Tokyo*

Takashi Nagai, *IIS, the University of Tokyo*

Ver.06 March 21, 2012

<http://www.okabe.iis.u-tokyo.ac.jp/core-to-core/rmw/>

The 7th Workshop on Reactive Metal Processing

March 16 (Friday) - March 17 (Saturday), 2012, MIT, Cambridge, MA

Time:

-1st day: on March 16 (9:00 - 17:00 and 18:30 - Banquet)

-2nd day: on March 17 (9:00 - 16:00)

Bread and coffee are prepared around 8:30 AM at the Grier room in both days.

Venue:

- Grier Room (Building 34, Room 401) (for workshop)

Building No.34 on Campus Map

Poster session is held on the outside of Grier Room.

- MIT Museum (for banquet)

Building No.N52 on Campus Map

<http://web.mit.edu/museum/>

Organizers:

Prof. Donald R. Sadoway,

Massachusetts Institute of Technology

Prof. Toru H. Okabe,

Institute of Industrial Science, the University of Tokyo

Program Coordinators:

Dr. Katsuhiko Nose,

Institute of Industrial Science, the University of Tokyo

Dr. Takashi Nagai,

Institute of Industrial Science, the University of Tokyo

Sponsor:

A part of the workshop is financially supported by the Rare Metal Research Workshop (RC-40: directed by Prof. Okabe), one of the Special Research Group organized by the Foundation for the Promotion of Industrial Science (FPIS).

Registration Fee:

\$200 / person (including banquet)

NOTICE: Please prepare to pay the registration fee in cash!

Contact Address:

Katsuhiko Nose, *Institute of Industrial Science, the University of Tokyo*

E-mail: nose-k@iis.u-tokyo.ac.jp Phone: +81-3-5452-6820

Workshop Program

Day 1

Morning, March 16 (Friday), 2012

@ Grier Room

8:30 – 9:00 **Coffee & Breakfast Service**

9:00 – 9:10 **Opening Remarks**

Prof. Donald R. Sadoway, Massachusetts Institute of Technology

Session Chair: *Prof. Toru H. Okabe*

9:10 – 9:55 **“Prediction and estimation of thermodynamic properties of metal chloride hydrates $MCl_x \cdot nH_2O$ ”**

William Judge and Georges J. Kipouros

Dalhousie University

9:55 – 10:20 **“Development of New Recycling Process for Platinum Group Metals”**

Katsuhiko Nose and Toru H. Okabe

Institute of Industrial Science, the University of Tokyo

10:20 – 10:45 **“Fundamental gas analysis from molten salts”**

Ole Kjos

SINTEF

10:45 – 11:05 Break

Session Chair: *Prof. Kazuki Morita*

11:05 – 11:30 **“Electrodeposition of Silicon from alkali fluoride melts”**

Karen Sende Osen

SINTEF

11:30 – 11:55 **“Thermodynamic Study for Removal of Phosphorus from Molten Silicon”**

Takashi Nagai

Institute of Industrial Science, the University of Tokyo

11:55 – 13:30 Lunch

Session Chair: *Prof. Georges J. Kipouros*

- 13:30 – 13:55 **“Liquid Phase Sintering of Magnesium”**
Paul Burke^{1,2}, *Joel McCully*² and *Georges J. Kipouros*²
1:Present Address: Department of Materials Science and Engineering,
Massachusetts Institute of Technology, 2:Dalhousie University
- 13:55 – 14:20 **“Zirconia Solid Electrolyte Application to Metal Production and Recycling:
Theory and Practice”**
Adam C. Powell IV, *Soobhankar Pati*
Metal Oxygen Separation Technologies, Inc.
- 14:20 – 14:45 **“Rechargeable alkaline metal batteries using intermediate-temperature
ionic liquids”**
*Toshiyuki Nohira*¹, *Rika Hagiwara*¹, *Toshinari Koketsu*¹, *Takayuki Yamamoto*¹,
*Atsushi Fukunaga*², *Shoichiro Sakai*², *Koji Nitta*² and *Shinji Inazawa*²
1:Kyoto University, 2:Sumitomo Electric Industries, Ltd.
- 14:45 – 15:30 **“Electrochemical engineering applied to materials processing: Electrolytic
Steel”**
Antoine Allanore
Massachusetts Institute of Technology
- 15:30 – 16:00 Break & Photo
- Session Chair: *Prof. Guðrún Sævarsdóttir*
- 16:00 – 16:25 **“Designing the liquid metal battery to a price point”**
Adam LaDelpha
Massachusetts Institute of Technology
- 16:25 – 16:50 **“A two-phase reference and counter electrode for electrochemical
characterization of calcium systems”**
John Rogosic
Massachusetts Institute of Technology
- 16:50 – 17:05 **“Liquid Metal Battery at TED2012”**
Donald R. Sadoway
Massachusetts Institute of Technology
- 18:30 – Banquet @ MIT museum

Day 2

Morning, March 17 (Saturday), 2012

@ Grier room

8:30 – 9:00 **Coffee & Breakfast Service**

9:00 – 9:10 **Opening Remarks**

Prof. Toru H. Okabe, Institute of Industrial Science, the University of Tokyo

Session Chair: *Dr. Egil Skybakmoen*

9:10 – 9:55 **“Electrodeposition of lead from chloride melts”**

Geir M. Haarberg

Norwegian University of Science and Technology

9:55 – 10:20 **“Effect of current density and phosphorus impurities on the current efficiency for aluminum deposition in cryolite-alumina melts in a laboratory cell”**

*Rauan Meirbekova*², *Gudrun Saevarsdottir*¹, *Geir Martin Haaberg*², *Joseph Prince Armoo*²

1:Reykjavik University, School of Science and Engineering, 2:Department of Materials Science and Engineering, NTNU

10:20 – 10:40 Break

Session Chair: *Prof. Geir M. Haarberg*

10:40 – 11:05 **“Electrochemical Behavior of Calcium-Bismuth Alloys in Molten Salt Electrolytes”**

Hojong Kim

Massachusetts Institute of Technology

11:05 – 11:50 **“Testing and data analysis of 1Ah liquid metal batteries”**

Ulrich Muecke

Massachusetts Institute of Technology

11:50 – 13:30 Lunch

Session Chair: *Prof. Tetsuya Uda*

13:30 – 13:55 **“Determination and modeling of the thermodynamic properties of liquid calcium-antimony alloys”**

Sophie Poizeau

Massachusetts Institute of Technology

13:55 – 14:20 **“Diffusivity Measurements in Liquid Alloys”**

Sal Barriga

Massachusetts Institute of Technology

14:20 – 14:50 **3-min Short Presentation by Poster Presenters**

14:50 – 15:50 **Poster Session**

15:50 – 16:00 **Closing Remarks**

Prof. Donald R. Sadoway, Massachusetts Institute of Technology

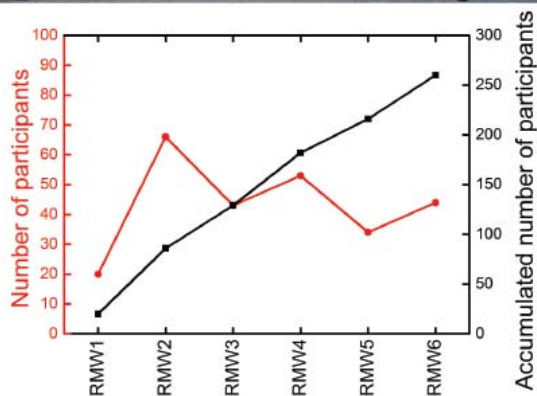
16:00 – **Laboratory Tour (for applicants)**

List of Poster Presentations

- 1. “The effect of Fe addition on the activity of Si in liquid Cu-Si alloys”**
Yuichi Kato, Takeshi Yoshikawa, Kazuki Morita
Institute of Industrial Science, the University of Tokyo
- 2. “Underpotential Dissolution of Precious Metals from Intermetallic Compounds with Zn”**
Hideaki Sasaki
Institute of Industrial Science, the University of Tokyo
- 3. “Study on Drying Characteristics of Australian Brown Coal using Superheated Steam”**
Tsuyoshi Kiriama
Department of Materials Engineering, the University of Tokyo
- 4. “Formation of Metallic Particles by Alkali Metal in Molten Chloride System”**
M. Tokushige¹, T. Nishikiori², G.M. Haarberg¹, and Y. Ito³
1:Department of Materials Science and Engineering, Norwegian University of Science and Technology, 2:R&D Division, I' MSEP Co., Ltd., 3:Energy Conversion Research Center, Doshisha University
- 5. “Production of Solar-grade Silicon from SiO₂ by Using Metal Hydrides as Reductants”**
Kouji Yasuda
Kyoto University
- 6. “FeTi Alloy Production by Electrolytic Reduction of (Fe,Ti) Oxide Electrodes in Molten Calcium Chloride”**
Mrutyunjay Panigrahi, Atsushi Iizuka, Etsuro Shibata and Takashi Nakamura
Institute of Multidisciplinary Research for Advanced Materials (IMRAM), Tohoku University
- 7. “Upgrading Ti Ore by Selective Chlorination”**
Jung Shin Kang and Toru H. Okabe
Institute of Industrial Science, the University of Tokyo
- 8. “The rate of HF formation during addition of aluminas in cryolite melts”**
Dian Mughni
Norwegian University of Science and Technology
- 9. “Consideration of Ti solubility in Sn, Sb, Pb or Bi and liquidus in Ti-Bi alloy”**
Sho Maruyama, Shohei Hayashi, Yuya Kado, Yoshitaro Nose, Tetsuya Uda
Kyoto University
- 10. “Development of a new recovery process of PGMs from scraps by using physical separation”**
Junpei Mitsui¹, Katsuhiko Nose² and Toru H. Okabe²
1:Department of Materials Engineering, Graduate School of Engineering, the University of Tokyo, 2:Institute of Industrial Science, the University of Tokyo

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



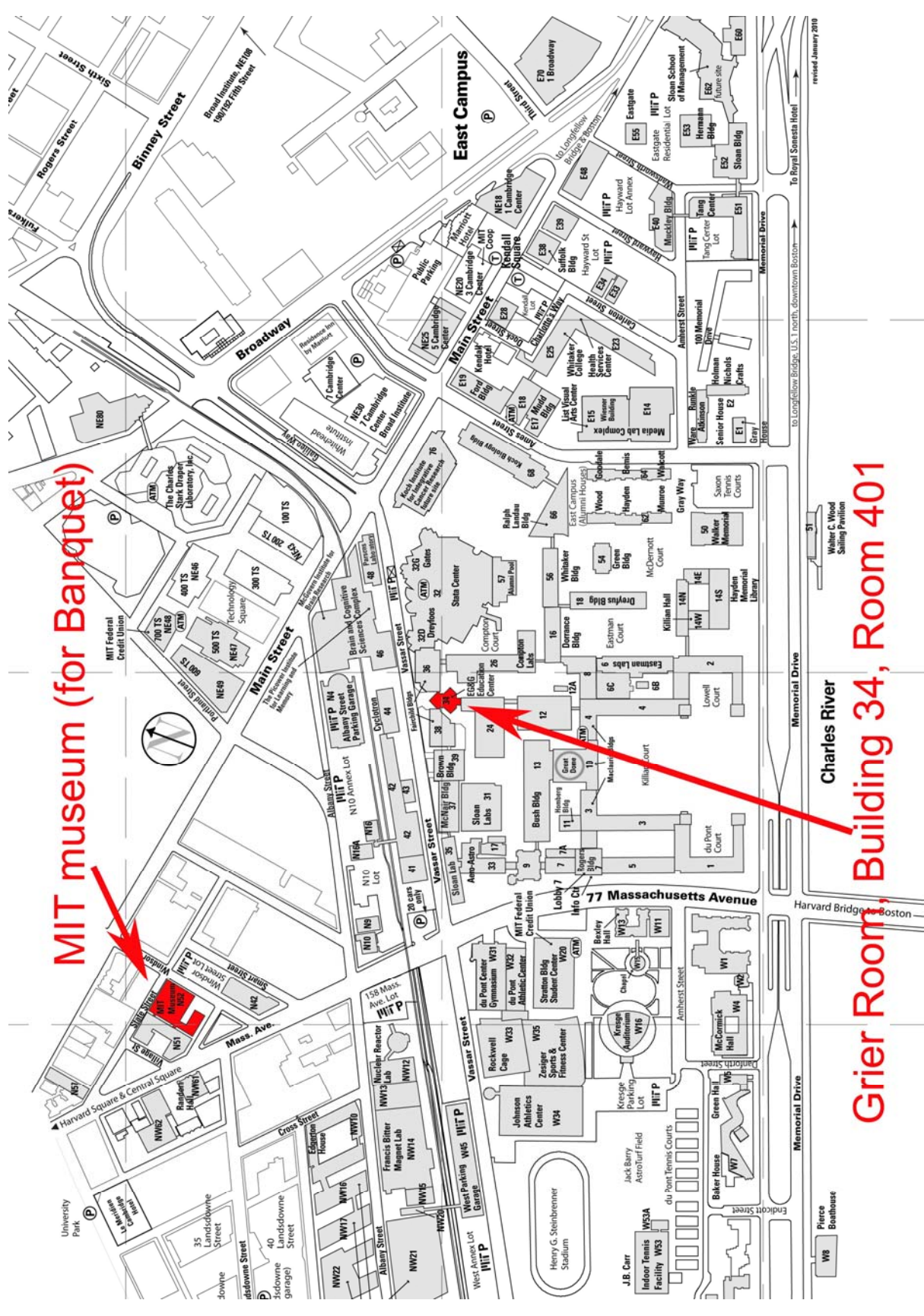
List of Participants

Allanore, Antoine	Postdoctoral Associate	MIT
Aziz, Kimberly	Undergraduate Student	MIT
Barriga, Sal	Graduate Student	MIT
Burke, Paul	Postdoctoral Associate	MIT
Caputo, Antonio	Postdoctoral Associate	MIT
Chandra, Kavita	Undergraduate Student	MIT
Chung, Brice	Visiting Scientist	MIT
Haarberg, Geir M.	Professor	NTNU
Hu, Qichao	Graduate Student	MIT
Jung Shin, Kang	PhD Candidate	IIS, the University of Tokyo
Kato, Yuichi	Graduate Student	IIS, the University of Tokyo
Kiriyama, Tsuyoshi	PhD Candidate	IIS, the University of Tokyo
Kim, Hojong	Postdoctoral Associate	MIT
Kipouros, Georges J.	Professor	Dalhousie University
Kjos, Ole	Research Scientist	SINTEF
LaDelpha, Adam	Research Engineer	MIT
Lau, Garrett	Undergraduate Student	MIT
Maruyama, Sho	Graduate Student	Kyoto University
Meirbekova, Rauan	PhD Candidate	Reykjavik University
Morita, Kazuki	Professor	IIS, the University of Tokyo
Muecke, Ulrich	Postdoctoral Associate	MIT
Mughni, Dian	Graduate Student	NTNU
Nagai, Takashi	Research Associate	IIS, the University of Tokyo
Nakamura, Takashi	Professor	IMRAM, Tohoku University
Nakatake, Masaya	Administrative Staff	IIS, the University of Tokyo
Newhouse, Jocelyn	Graduate Student	MIT
Ning, Xiaohui	Postdoctoral Associate	MIT
Nohira, Toshiyuki	Associate Professor	Kyoto University
Nose, Katsuhiko	Project Research Associate	IIS, the University of Tokyo
Nose, Tomoka		Dr. Nose's spouse
Okabe, Toru H.	Professor	IIS, the University of Tokyo
Okabe, Yu Anne		Prof. Okabe's daughter
Oldfield, Brian	Undergraduate Student	MIT
Osen, Karen Sende	Research Scientist	SINTEF
Ouchi, Takanari	Postdoctoral Associate	MIT
Panigrahi, Mrutyunjay	Ph.D Candidate	IMRAM, Tohoku University
Phadke, Satyajit	Postdoctoral Associate	MIT
Poizeau, Sophie	Graduate Student	MIT
Powell IV, Adam C.	CTO	MOxST
Rogoscic, John	Graduate Student	MIT
Rosenberg, Rebecca		Prof. Sadoway's spouse
Sadoway, Donald R.	John F. Elliott Professor of Materials Chemistry	MIT
Sævarsdóttir, Guðrún	Associate Professor	Reykjavik University
Sasaki, Hideaki	Project Research Associate	IIS, the University of Tokyo

List of Participants

Sato, Akihiro	Vice President	Business Department Division, IHI Inc.
Sheldon, Hilary	Administrative Staff	MIT, Prof. Sadoway's secretary
Skybakmoen, Egil	Research Manager	SINTEF
Spatocco, Brian	Graduate Student	MIT
Tadokoro, Mari	Administrative Staff	IIS, the University of Tokyo
Thompson, Gregory	Postdoctoral Associate	MIT
Tokushige, Manabu	Postdoctoral Researcher	NTNU
Uda, Tetsuya	Associate Professor	Kyoto University
Ueno, Masatoshi		AGC America Inc.
Wada, Makiko	Administrative Staff	MIT
Wang, Kangli	Postdoctoral Associate	MIT
Yasuda, Kouji	Assistant Professor	Kyoto University
Yin, Lan	Postdoctoral Associate	MIT

MIT museum (for Banquet)



Charles River

Grier Room, Building 34, Room 401

