

# The 4<sup>th</sup> Workshop on Reactive Metal Processing

March 14 (Friday) - March 15 (Saturday), 2008, Cambridge, MIT

Workshop Organizer:

Prof. D.R. Sadoway, Massachusetts Institute of Technology,

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

## Workshop Program

Morning, March 14 (Friday), 2008

Chipman Room 6-104

AM1, Session chair: Prof. D.R. Sadoway

8:00–8:10

**Opening Remarks**

Prof. Donald R. Sadoway, Massachusetts Institute of Technology

8:10–8:45

**“Dehydration Kinetics of Magnesium Chloride as a First Step in the Electrowinning of Magnesium Metal”**

Prof. Georges J. Kipouros, Dalhousie University

8:45–9:20

**“Electrodeposition of Refractory Metals from Ionic Liquids”**

Prof. Toshiyuki Nohira, Kyoto University

9:20–9:55

**“Oxygen and Metals Production on the Moon: Will Materials Science Change Our Future in Space?”**

Dr. Laurent Sibille, ASRC Aerospace Corporation

9:55–10:15

**Break**

AM2, Session chair: Prof. D.R. Sadoway

10:15–10:50

**“From Lanthanum to Ytterbium – a Long Route: Investigation Methods and Recent Results on Lanthanide Halide Systems”**

Prof. Marcelle Gaune-Escard, IUSTI

10:50–11:25

**“Producing Titanium Metal Powder by Selective Chlorination and Preform Reduction Process”**

Prof. Haiyan Zheng, Northeastern University

11:25–12:00

**“Suitability of Iron Ore Pyroelectrolysis for CO<sub>2</sub> Mitigation in Steel Production”**

Dr. Hervé Lavelaine, ArcelorMittal

12:00–13:15

**Lunch (Bush Room 10-105)**

Afternoon, March 14 (Friday), 2008

Chipman Room 6-104

PM1, Session chair: Prof. D.R. Sadoway

- 13:15–13:50     **“Electrochemical Production of Metals in Molten Salts with the Use of Solid Oxide Electrolyte Membranes”**  
Prof. Uday B. Pal, Boston University
- 13:50–14:25     **“Self-and Impurity Diffusion in  $\gamma$ -TiAl Single Crystals”**  
Dr. Yoshitaro Nose, Kyoto University
- 14:25–14:50     **“Investigation for Phase Equilibria of Nd<sub>2</sub>O<sub>3</sub>-LiF-NdF<sub>3</sub> System”**  
Dr. Osamu Takeda, Tohoku University
- 14:50–15:10     **Break**

PM2, Session chair: Prof. D.R. Sadoway

- 15:10–15:45     **“Phase-Field Modeling of Electrochemical Systems Involving Liquid Metals”**  
Dr. Adam C. Powell, IV, Opennovation
- 15:45–16:20     **“Thermal Conductivity of the Silicate Melts”**  
Prof. Young-Jo Kang, University of Tokyo
- 16:20–16:55     **“Titanium and Titanium Alloy Production by Electrochemical Reduction of Oxides”**  
Dr. Kevin Dring, Norsk Titanium AS
- 16:55–17:20     **“Research Progress, Synthesis of Nano-Composite Nitride”**  
Prof. Hongmin Zhu, University of Science and Technology Beijing
- 17:30–20:00     **Workshop Reception & Banquet**  
**(MIT Museum, 265 Massachusetts Avenue)**  
A part of the banquet is financially supported by the Rare Metal Research Meeting, organized by the Foundation for the Promotion of Industrial Science (FPIS)

Morning, March 15 (Saturday), 2008

Chipman Room 6-104

AM1, Session chair: Prof. G.J. Kipouros

- 8:30–8:40      **Greetings**  
Prof. Donald R. Sadoway, Massachusetts Institute of Technology
- 8:40–8:55      **“Issues in the Powder Metallurgy of Magnesium”**  
Mr. P. Burke, Dalhousie University
- 8:55–9:10      **“Application of Double Knudsen Cell Mass Spectrometry to Measure on Thermodynamic Properties of Calcium Phosphates”**  
Mr. T. Nagai, the University of Tokyo
- 9:10–9:25      **“Activity Measurement of REs and Their Alloy System Using Multi-Knudsen Cell Mass Spectrometry”**  
Mr. W.-H. Han, the University of Tokyo
- 9:25–9:40      **“Dissolution Rates of Precious Metal Compounds in Acid”**  
Mr. H. Sasaki, the University of Tokyo
- 9:40–9:55      **Break**

AM2, Session chair: Prof. G.J. Kipouros

- 9:55–10:10      **“Microwave Treatment of Blast Furnace Slag”**  
Mr. T. Kuroki, the University of Tokyo
- 10:10–10:25      **“Reduction of Titanium Oxide in the Presence of Nickel by Supercooled Monatomic Hydrogen”**  
Mr. H. Sekimoto, Kyoto University
- 10:25–10:40      **“Cathodic Polarization Behavior of Ionic Liquid Containing Titanium Ions”**  
Mr. K. Tsuchimoto, Kyoto University
- 10:40–10:55      **Break**

AM3, Session chair: Prof. G.J. Kipouros

- 10:55–11:10      **“Refining of Si by the Solidification with Eutectic Molten Alloy at Low Temperature”**  
Mr. Y. Nishi, the University of Tokyo
- 11:10–11:25      **“Preparation of  $\beta$ -FeSi<sub>2</sub> Films by Exchange Reaction between Si Wafer and Molten Salts”**  
Mr. M. Sakamoto, the University of Tokyo

- 11:25–11:40      **“Recovery of Nd and Dy from Rare Earth Magnet Scrap”**  
Ms. S. Shirayama, the University of Tokyo
- 11:40–11:55      **“Fundamental Study on Titanium Production Process by  
Disproportionation Reactions of  $\text{TiCl}_2$  in  $\text{MgCl}_2$  Molten Salt”**  
Mr. T. Oi, the University of Tokyo
- 12:00–13:00      **Lunch (Von Hippel Room 13-2137)**

Afternoon, March 15 (Saturday), 2008    Chipman Room 6-104

PM1, Session chair: Prof. G.J. Kipouros

- 13:00–13:20      **“Electrochemical Reduction of Titanium Dioxide in Molten Oxide  
Electrolytes”**  
Dr. C. de Alwis, Massachusetts Institute of Technology
- 13:20–13:40      **“Electrochemical Reduction of Titanium Dioxide to Titanium  
Metal in Molten Calcium Chloride”**  
Dr. P.K. Tripathy, Massachusetts Institute of Technology
- 13:40–14:00      **“Investigation of Stabilizing Additives and Interactions for  
Lithium Ion Batteries Electrolyte and Cathodes”**  
Dr. W. Li, Massachusetts Institute of Technology
- 14:00–14:20      **“Electrochemical Processes in the Rechargeable Zinc-Silver  
Battery”**  
Dr. T. Yamaki, Massachusetts Institute of Technology
- 14:20–14:30      **Closing Remarks**  
Prof. Donald R. Sadoway, Massachusetts Institute of Technology
- 14:30–15:15      **Tour of Sadoway Laboratory and MIT Campus**
- 15:15              **Depart**

## List of Participants

**Barriga, Sal**, Graduate Student, Massachusetts Institute of Technology

**Bradwell, David**, Graduate Student, Massachusetts Institute of Technology

**Burke, Paul**, Graduate Student, Faculty of Engineering, Dalhousie University

**De Alwis, Chanaka**, Post-doctoral Associate, Massachusetts Institute of Technology

**Delucas, Rachel**, Graduate Student, Boston University

**Dragan, Mirela**, Post-doctoral Associate, Massachusetts Institute of Technology

**Dring, Kevin**, Chief Technology Officer, Norsk Titanium AS

**Gaune-Escard, Marcelle**, Professor, Institut Universitaire des Systemes Thermiques Industriels (IUSTI)

**Han, Woong-Hee**, Graduate Student, Institute of Industrial Science, the University of Tokyo

**Hofstra, Peer**, Undergraduate Student, Massachusetts Institute of Technology

**Ji, Xiaobo**, Post-doctoral Associate, Massachusetts Institute of Technology

**Kang, Young-Jo**, Research Associate, Institute of Industrial Science, the University of Tokyo

**Kim, Frederick**, Undergraduate Student, Massachusetts Institute of Technology

**Kipouros, Georges J.**, Professor of Materials Engineering,  
Director of Minerals Engineering Centre, Faculty of Engineering, Dalhousie University

**Kuroki, Tomonori**, Graduate Student, Institute of Industrial Science, the University of Tokyo

**Lavelaine, Herve**, ArcelorMittal Maizieres

**Li, Wentao**, Post-doctoral Associate, Massachusetts Institute of Technology

**Miyake, Masao**, JSPS Research Fellow, University of Illinois

**Morita, Kazuki**, Professor, Institute of Industrial Science, the University of Tokyo

**Nagai, Takashi**, Graduate Student, Institute of Industrial Science, the University of Tokyo

**Nishi, Yuki**, Graduate Student, Institute of Industrial Science, the University of Tokyo

**Nohira, Toshiyuki**, Associate Professor, Graduate School of Energy Science, Kyoto University

**Nose, Yoshitaro**, Research Associate,  
Department of Materials Science and Engineering, Graduate School of Engineering, Kyoto University

**Oi, Taiji**, Graduate Student, Institute of Industrial Science, the University of Tokyo

**Okabe, Toru H.**, Associate Professor, Institute of Industrial Science, the University of Tokyo

**Ortiz, Luis**, Visiting Scientist, Massachusetts Institute of Technology

**Pal, Uday B.**, Professor, Boston University

**Pati, S.**, Graduate Student, Boston University

**Poizeau, Sophie**, Graduate Student, Massachusetts Institute of Technology

**Powell, Adam C. IV**, Principal, Opennovation

**Rosenberg, Rebecca**, Donald Sadoway's spouse

**Sadoway, Donald R.**, John F. Elliott Professor of Materials Chemistry, Massachusetts Institute of Technology

**Sakamoto, Motohiro**, Graduate Student, Institute of Industrial Science, the University of Tokyo

**Sakkas, Petras**, Graduate Student, Boston University

**Mrs. Sakkas**, Petras Sakkas' spouse

**Sasaki, Hideaki**, Graduate Student, Institute of Industrial Science, the University of Tokyo

**Sekimoto, Hidehiro**, Graduate student,  
Department of Materials Science and Engineering, Graduate School of Engineering, Kyoto University

**Shirayama, Sakae**, Graduate Student, Institute of Industrial Science, the University of Tokyo

**Sibille, Laurent**, ASRC Aerospace Corporation

**Sibille, Tyra**, Laurent Sibille's spouse

**Takeda, Osamu**, Research Associate,  
Department of Metallurgy, Graduate School of Engineering, Tohoku University

**Tripathy, P.K.**, Post-doctoral Associate, Massachusetts Institute of Technology

**Tsuchimoto, Kazuaki**, Graduate student,  
Department of Materials Science and Engineering, Graduate School of Engineering, Kyoto University

**Uda, Tetsuya**, Associate Professor,  
Department of Materials Science and Engineering, Graduate School of Engineering, Kyoto University

**Yamaki, T.**, Post-doctoral Associate, Massachusetts Institute of Technology

**Yasuda, Kouji**, Post-doctoral Associate, Institute of Industrial Science, the University of Tokyo

**Yurko, James**, 22Ti, Woburn, MA

**Zheng, Haiyan**, Assistant Professor, Institute of Ferrous Metallurgy, Northeastern University

**Zhu, Hongmin**, Cheung Kong Professor,  
School of Metallurgical and Ecological Engineering, University of Science and Technology Beijing

#### Administrative support staff from the University of Tokyo

**Horikoshi, Takahiro**, Administrative staff, Institute of Industrial Science, the University of Tokyo

**Okano, Takayuki**, Administrative staff, Institute of Industrial Science, the University of Tokyo

**Takita, Mayu**, Administrative staff, Institute of Industrial Science, the University of Tokyo

#### Administrative support staff from Massachusetts Institute of Technology

**Sheldon, Hilary**, Administrative Assistant to Professor Sadoway,  
Department of Materials Science & Engineering, Massachusetts Institute of Technology

## Summary of Participants and Lectures

Participants:

58 people

Participating countries:

6 countries

(Canada, China, France, Japan, Norway and USA)

Lectures:

28 lectures

(9 professors and associate professors, 4 professional researchers,  
4 post doctoral researchers and 11 graduate students)