

**RMW17**

**The 17th Workshop on Reactive Metal Processing**

**March 8 (Fri.) – 9 (Sat.), 2024 @ Boston/Cambridge**

(After TMS 2024, March 3 (Sun.) – 7 (Thu.), 2024 @ Orlando, Florida)

**Organizers:**

**Donald R. Sadoway**, *Massachusetts Institute of Technology*

**Toru H. Okabe**, *Institute of Industrial Science (IIS),*

*The University of Tokyo*

**Antoine Allanore**, *Massachusetts Institute of Technology*

**Shunsuke Yagi**, *IIS, The University of Tokyo*

**Program Coordinators:**

**Takanari Ouchi**,*IIS*, *The University of Tokyo*

**Gen Kamimura**,*Massachusetts Institute of Technology*

**Isaac Oda-Bayliss**,*IIS*, *The University of Tokyo*

**Ethan Benderly-Kremen**, *Massachusetts Institute of Technology*

**Kai Shimada**,*IIS*, *The University of Tokyo*

Sponsors

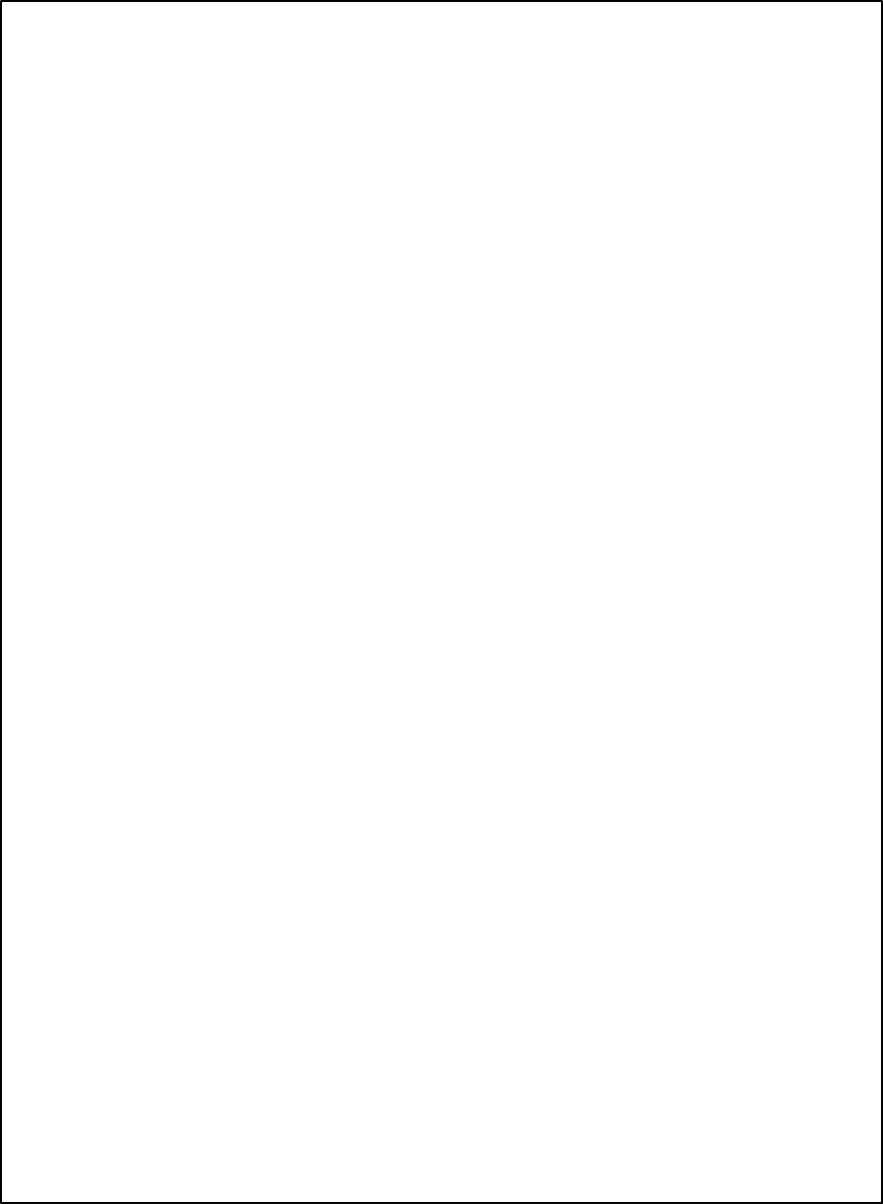
* The Rare Metal Research Workshop, one of the Special Research Groups organized by the Foundation for the Promotion of Industrial Science (FPIS)
* (RC-40: directed by Prof. T. H. Okabe, RC-104: directed by Prof. S. Yagi)
* Research Center for Sustainable Material Energy Integration (SUSMAT)
* Institute of Industrial Science, The University of Tokyo (IIS UTokyo SYMPOSIUM No.118)

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

**The 17th Workshop on Reactive Metal Processing**

**(IIS UTokyo SYMPOSIUM No.118)**

March 8 (Fri.) – March 9 (Sat.), 2024, MIT, Cambridge, MA



Time:

* 1st day: on March 8 (10:00 – 17:00 and Banquet at 18:30)
* 2nd day: on March 9 (10:00 – 14:00)  
  Refreshments will be served around 9:00 AM on both days.

Venue:

* **Haus Allen Room (MIT)**
* **Le Méridien Cambridge**

Registration Fee:

$300 / person

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*

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Contact:

Isaac Oda-Bayliss, *IIS, The University of Tokyo*

E-mail: [aisaku-oda@g.ecc.u-tokyo.ac.jp](mailto:aisaku-oda@g.ecc.u-tokyo.ac.jp)

**Workshop Program**

**Day 1**

Morning, March 8 (Friday), 2024 @ Haus Allen Room (MIT)

19:00 – 10:00 **Coffee & Breakfast Service**

10:00 – 10:10 **Opening Remarks**

*Prof. Antoine Allanore*

*Massachusetts Institute of Technology*

Session Chair: *Prof. Antoine Allanore*

10:10 – 10:40 **The Impact of Inert Anode Technology on Primary Aluminum Smelting**

*Donald R. Sadoway*

*Massachusetts Institute of Technology*

10:40 – 11:00 **Break**

Session Chair: *Prof. Jungshin Kang*

11:00 – 11:30 **Origin of Catalytic Activity for Oxygen Evolution Reaction**

*Shunsuke Yagi*

*IIS, The University of Tokyo*

11:30 – 12:00 **Electrolytic Production of Iron in Molten Sulfides**

*Antoine Allanore*

*Massachusetts Institute of Technology*

12:00 – 13:00 **Lunch**

Session Chair: *Prof. Adam C. Powell IV*

13:00 – 13:30 **Iron- and Steel-Making Slag Valorization ~Some Trials toward Sustainable Society in Japan~**

*Kazuki Morita*

*The University of Tokyo*

13:30 – 14:00 **Recycling Li-Ion Batteries - A Crucial Step Towards Sustainability**

*Ragnhild Elizabeth Aune*

*Norwegian University of Science and Technology*

14:00 – 14:20 **Photo & Break**

Session Chair: *Dr. Gen Kamimura*

14:20 – 15:20 **3-min Short Presentation by Poster Presenters**

15:20 – 16:20 **Poster Session at the Haus Room and Allen Room at Building 36**

18:00 – **Reception** @ Le Méridien Cambridge

18:30 – **Banquet** @ Le Méridien Cambridge

**Day 2**

Morning, March 9 (Saturday), 2024 @ Haus Allen Room (MIT)

9:00 – 10:00 **Coffee & Breakfast Service**

10:00 – 10:10 **Opening Remarks**

*Prof. Shunsuke Yagi*

*IIS, The University of Tokyo*

Session Chair: *Prof. Shunsuke Yagi*

10:10 – 10:40 **SOLSTICE – European molten salt battery research**

*Ole Kjos*

*SINTEF Industry*

10:40 – 11:00 **Break**

Session Chair: *Dr. Takanari Ouchi*

11:00 – 11:30 **Investigation of deoxidation method for off-grade titanium sponge using Mg metal under high hydrogen chemical potential**

*Jungshin Kang*

*Seoul National University*

11:30 – 12:00 **Metal Production in the Age of Renewables**

*Adam C. Powell IV*

*Worcester Polytechnic Institute*

12:00 – 12:10 **Information for the Next RMW**

*Prof. Toru H. Okabe*

*IIS, The University of Tokyo*

12:10 – 12:20 **Closing Remarks**

*Prof. Donald R. Sadoway*

*Massachusetts Institute of Technology*

12:20 – 13:30 **Lunch**

13:30 – **Laboratory Tour**

**List of Poster Presenters**

1. **Effect of Vanadium Doping on α-K*x*MnO2 Positive Electrode Active Materials for Rechargeable Magnesium Batteries***Isaac Oda-Bayliss*1,2,  
   1Department of Materials Engineering, Graduate School of Engineering, The University of Tokyo  
   2Institute of Industrial Science, The University of Tokyo
2. **Sulfidation treatment of apatite for alternative phosphorus fertilizers**  
   *Ava Waitz*1,  
   1Massachusetts Institute of Technology
3. **Electrochemical Behavior of Alkaline Hematite Reduction**  
   *Gavin Winter*1,  
   1Massachusetts Institute of Technology
4. **Iron production through Molten Sulfide electrolysis**  
   *Kimaya Suryarao*1,  
   1Massachusetts Institute of Technology
5. **Dissolved Gas Studies in Molten Chloride Salts**  
   *Nathan Bradshaw*1,  
   1Massachusetts Institute of Technology
6. **Recovery of REE from magnets via non-oxidative pathway**  
   *Zachary Adams*1,  
   1Massachusetts Institute of Technology
7. **Concentration of precious metals from ores or scraps using electrochemical anodic deposition in molten salt electrolyte**  
   *Yuka Kujiraoka*1,2,  
   1Department of Materials Engineering, Graduate School of Engineering, The University of Tokyo  
   2Institute of Industrial Science, The University of Tokyo
8. **Zero Emission Silicon and Manganese Production through Electrowinning**  
   *Gøril Jahrsengene*1,  
   1SINTEF

**List of Poster Presenters**

1. **Molten salt electrolysis of MgO using high-density metal cathode and vacuum distillation for the production of high-purity Mg metal**  
   *Hyeong-Jun Jeoung*1,  
   1Seoul National University
2. **Differential Thermal Analysis of Nickel Sulfide for Molten Sulfide Electrolysis**  
   *Lucas Marden*1,  
   1Massachusetts Institute of Technology
3. **The intrinsic chemical reaction rate for the sulfidation of artificial ferric oxide**  
   *Matthew Michalek*1,  
   1Massachusetts Institute of Technology
4. **Recycling of Magnesium alloy using G-METS distillation**  
   *Daniel Mc Arthur Sehar*1,  
   1Worcester Polytechnic Institute
5. **Development of a new deoxidation method for titanium using the vapors of rare earth metals and yttrium chloride**  
   *Tomoki Yamazaki*1,2,  
   1Department of Materials Engineering, Graduate School of Engineering, The University of Tokyo  
   2Institute of Industrial Science, The University of Tokyo
6. **The Catalytic Activity of Transition Metal Doped α-MnO2 for Oxygen Evolution Reaction**  
   *Kai Shimada*1,2,  
   1Department of Materials Engineering, Graduate School of Engineering, The University of Tokyo  
   2Institute of Industrial Science, The University of Tokyo
7. **Metal Leaching And Multiple Effect Distillation for Rare Earth Magnet Recycling**  
   *Emmanuel Offei Opoku*1,  
   1Worcester Polytechnic Institute
8. **Monte Carlo Cost Modeling of Magnesium Primary Production**  
   *Isaak Donley Olson*1,  
   1Worcester Polytechnic Institute
9. **Reduced Order Model of Magnesium Distillation Apparatus**   
   *Artem Iurkovskyi*1, *Armaghan Telgerafchi*1,  
   1Worcester Polytechnic Institute

**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

2015 **The 10th Workshop on Reactive Metal Processing (RMW10)**

March 20 (Fri.) - March 21 (Sat.), Cambridge, MIT

2016 **The 11th Workshop on Reactive Metal Processing (RMW11)** February 19 (Fri.) - February 20 (Sat.), Cambridge, MIT

2017 **The 12th Workshop on Reactive Metal Processing (RMW12)**

March 3 (Fri.) - March 4 (Sat.), Cambridge, MIT

2018 **The 13th Workshop on Reactive Metal Processing (RMW13)**

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

2019 **The 14th Workshop on Reactive Metal Processing (RMW14)**

March 15 (Fri.) - March 16 (Sat.), Cambridge, MIT

2020 **The 15th Workshop on Reactive Metal Processing (RMW15)**

February 28 (Fri.) - February 29 (Sat.), San Diego, UC San Diego

2023 **The 16th Workshop on Reactive Metal Processing (RMW16)**

March 24 (Fri.) - March 25 (Sat.), Cambridge, MIT

**RMW1 in 2006 at MIT RMW2 in 2006 at IIS**

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**RMW5 in 2010 at Seattle RMW16 in 2023 at MIT**

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**List of Participants**

| Adam Powell | Associate Professor | Worcester Polytechnic Institute |
| --- | --- | --- |
| Antoine Allanore | Professor | MIT |
| Armaghan Telgerafchi | PhD graduate student | Worcester Polytechnic Institute |
| Artem Iurkovskyi | Undergraduate Researcher | Worcester Polytechnic Institute |
| Ava Waitz | Graduate Student | MIT |
| Benjamin Sabatini | Postdoctoral Associate | MIT |
| Bohdanna Naidych | Postdoctoral Associate | Sadoway Labs Foundation |
| Caspar Stinn | Principal Scientist | Outokumpu |
| Charles Boury | Graduate Student | MIT |
| Daniel Mc Arthur Sehar | PhD graduate student | Worcester Polytechnic Institute |
| Donald Sadoway | Professor Emeritus | MIT |
| Egil Skybakmoen | Research Manager | SINTEF |
| Emmanuel Opoku | Research Assistant | Worcester Polytechnic Institute |
| Ethan Benderly-Kremen | Graduate Student | MIT |
| Eve Meltzer | Graduate Student | MIT |
| Gavin Winter | Graduate Student | MIT |
| Gen Kamimura | Postdoctoral Associate | MIT |
| Gøril Jahrsengene | Research Scientist | SINTEF |
| Hiroyuki Iwasaki | Technical advisor | KINA Corporation |
| Hyeong-Jun Jeoung | Graduate Student | Seoul National University |
| Isaac Oda-Bayliss | Graduate Student | IIS, The University of Tokyo |
| Isaak Olson | Undergraduate Research Assistant | Worcester Polytechnic Institute |
| Jacob Brown | CTO | Magrathea |
| Johanna Castillo | Assistant | Worcester Polytechnic Institute |
| John van Eeghen | Director | US Green Magnesium LLC |
| Jonathan Paras | Harry S. Truman Fellow | Sandia National Laboratories |
| Joseph Lessard | Materials Engineer | Apple Inc. |
| Jungshin Kang | Assistant Professor | Seoul National University |
| Kai Shimada | Graduate Student | IIS, The University of Tokyo |
| Kali Simonds | Engineer | Sadoway Labs Foundation |
| Katie Daehn | Research Scientist | MIT |
| Kazuki Morita | Professor | The University of Tokyo |
| Kim Peace | International Consultant | Phoenix Tailings |
| Kimaya Suryarao | Graduate Student | MIT |
| Lucas Marden | Undergraduate Student | MIT |

**List of Participants**

| Masatoshi Ueno | Managing Director | Komatsu |
| --- | --- | --- |
| Matthew Humbert | Staff Scientist | Sadoway Labs Foundation |
| Matthew Michalek | Graduate Student | MIT |
| Midori Yoneyama | Administrative Staff | IIS, The University of Tokyo |
| Natalie Chapman | Graduate Student | MIT |
| Nathan Bradshaw | Graduate Student | MIT |
| Nathan Hastings | Student | Worcester Polytechnic Institute |
| Ole Kjos | Senior Research Scientist | SINTEF Industry |
| Ragnhild Aune | Professor | NTNU |
| Richard Bradshaw | COO | Sadoway Labs Foundation |
| Richard Salvucci | Principal Development Engineer | Phoenix Tailings |
| Rin Hirotani | Administrative Staff | IIS, The University of Tokyo |
| Shingo Katayama | Advisor | NIPPON DENKO Co., Ltd. |
| Shunsuke Yagi | Associate Professor | IIS, The University of Tokyo |
| Sung-Hun Park | Postdoctoral Associate | Seoul National University |
| Tae-Hyuk Lee | Senior Researcher | KIGAM |
| Takanari Ouchi | Assistant Professor | IIS, The University of Tokyo |
| Tatsuya Nakazawa | Section Manager | TANAKA Precious Metals |
| Tomás Villalon | CTO | Phoenix Tailings |
| Tomoki Yamazaki | Graduate Student | IIS, The University of Tokyo |
| Toru Okabe | Professor | IIS, The University of Tokyo |
| Xueqi Pang | Postdoctoral Associate | Sadoway Labs Foundation |
| Yuka Kujiraoka | Graduate Student | IIS, The University of Tokyo |
| Zachary Adams | Graduate Student | MIT |

**Venue Details**

Workshop:

Haus Allen Room

Building 36, Room 462 (4th floor)

50 Vassar St, Cambridge, MA 02139

Interactive Campus Map available at: <http://whereis.mit.edu/>

Banquet:

Le Méridien Boston Cambridge

20 Sidney St, Cambridge, MA 02139

