

# The 176th ISIJ Meeting

## Date

September 19 to 21, 2018

## Venue

### **Tohoku University, Kawauchi Campus**

(41 Kawauchi, Aoba-ku, Sendai, Miyagi, Japan 980-8576)

[https://www.tohoku.ac.jp/en/about/map\\_directions.html](https://www.tohoku.ac.jp/en/about/map_directions.html)

### **Sendai International Center, Exhibition Building** ※Poster Session for Students ONLY

(Aobayama, Aoba-ku, Sendai, Miyagi, Japan 980-0856)

<http://www.aobayama.jp/english/access/>

## Access

- **Tohoku University, Kawauchi Campus is a 3-minute walk from exit at South gate 1 or 2 of Kawauchi Station, Subway Tozai Line.**
- **Sendai International Center is a 3-minute walk from Sendai International Center Station, Subway Tozai Line.**

### **From Sendai Station to Kawauchi Station**

Sendai Sta. → 〈Subway Tozai Line/Yagiyama Zoological Park-bound Local train/6min.〉 → Kawauchi Sta.

### **From Sendai Airport to Kawauchi Station**

Sendai Airport → 〈Sendai Airport access Line/17~25min.〉 → Sendai Sta.

→ 〈Subway Tozai Line/Yagiyama Zoological Park-bound Local train/6min.〉 → Kawauchi Sta.

### **From Sendai Station to Sendai International Center Station**

Sendai Sta. → 〈Subway Tozai Line/ Yagiyama Zoological Park-bound Local train /5min.〉

→ Sendai International Center Station

### **From Sendai Airport to Sendai International Center Station**

Sendai Airport → 〈Sendai Airport access Line/17~25min.〉 → Sendai Sta.

→ 〈Subway Tozai Line/ Yagiyama Zoological Park-bound Local train /5min.〉

→ Sendai International Center Station

For more information, please visit the website of each facility.

## Banquet

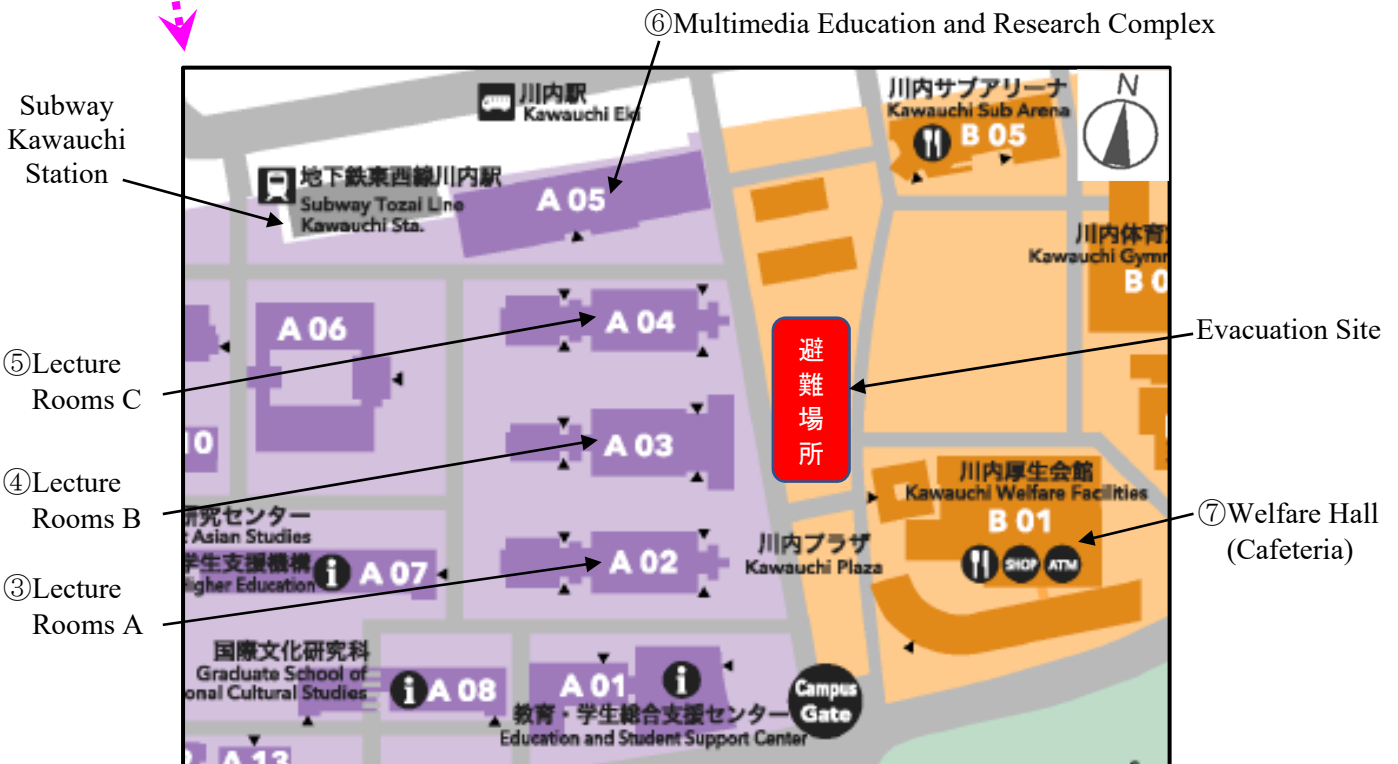
1. Date: September 19, 2018 18:30~20:30
2. Venue: Hotel Metropolitan Sendai, Grand Ballroom Chiyo (4th Fl.)  
(1-1-1, Chuo, Aoba-ku, Sendai, Miyagi Japan 980-8477)  
<https://www.sendaimetropolitan.jp/en-gb>
3. Fee: 10,000yen

**Campus map**



② Sendai International Center, Exhibition Building

① Hotel Metropolitan Sendai



① Hotel Metropolitan Sendai: Banquet(Sept. 19, 2018)

② Sendai International Center, Exhibition Building: Poster Session for Students(Sept. 20, 2018)

③ Lecture Rooms A: ISIJ Secretariat, Session Room 4,5,13,14(1st Fl.), Session Room 7,8 (4th Fl.)

④ Lecture Rooms B: ISIJ Reception Desk, Session Room 1-3(1st Fl.), Session Room 9-12(2nd Fl.)

⑤ Lecture Rooms C: JIM Session Room A-Q

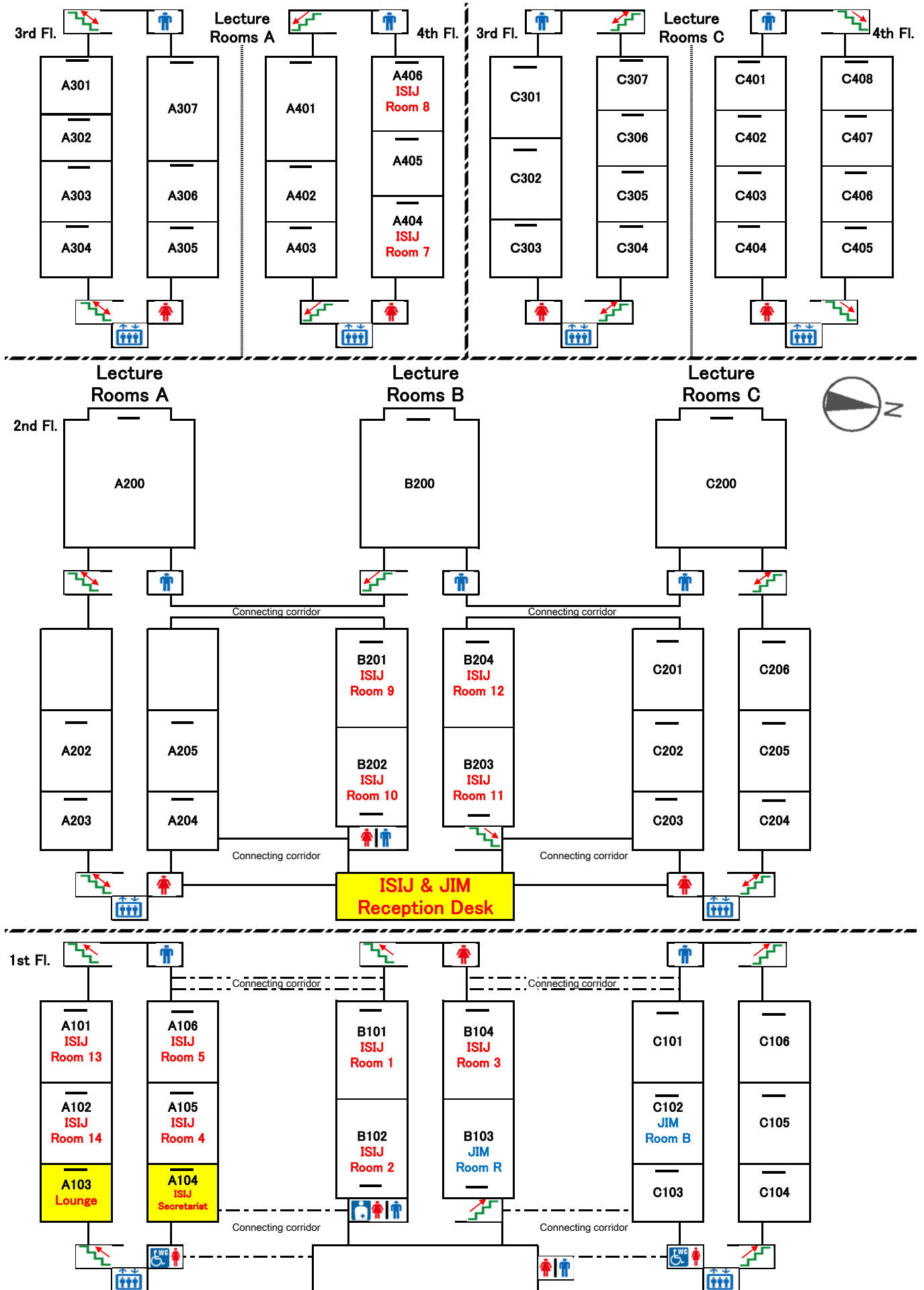
⑥ Multimedia Education and Research Complex: Session Room 6,15(6th Fl.)

⑦ Welfare Hall: Cafeteria, Shop, ATM

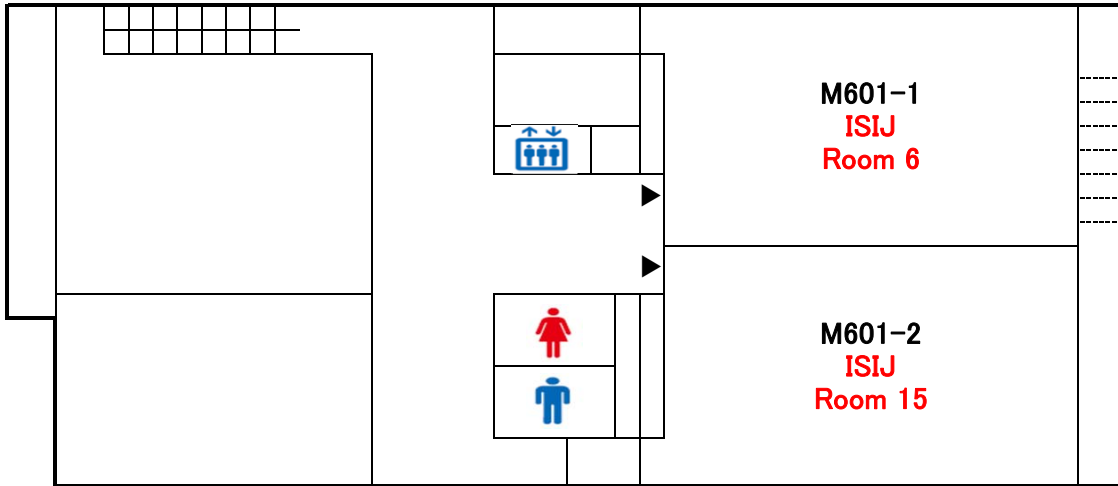
**No smoking is allowed inside the campus.**

# ISIJ Session Room Map

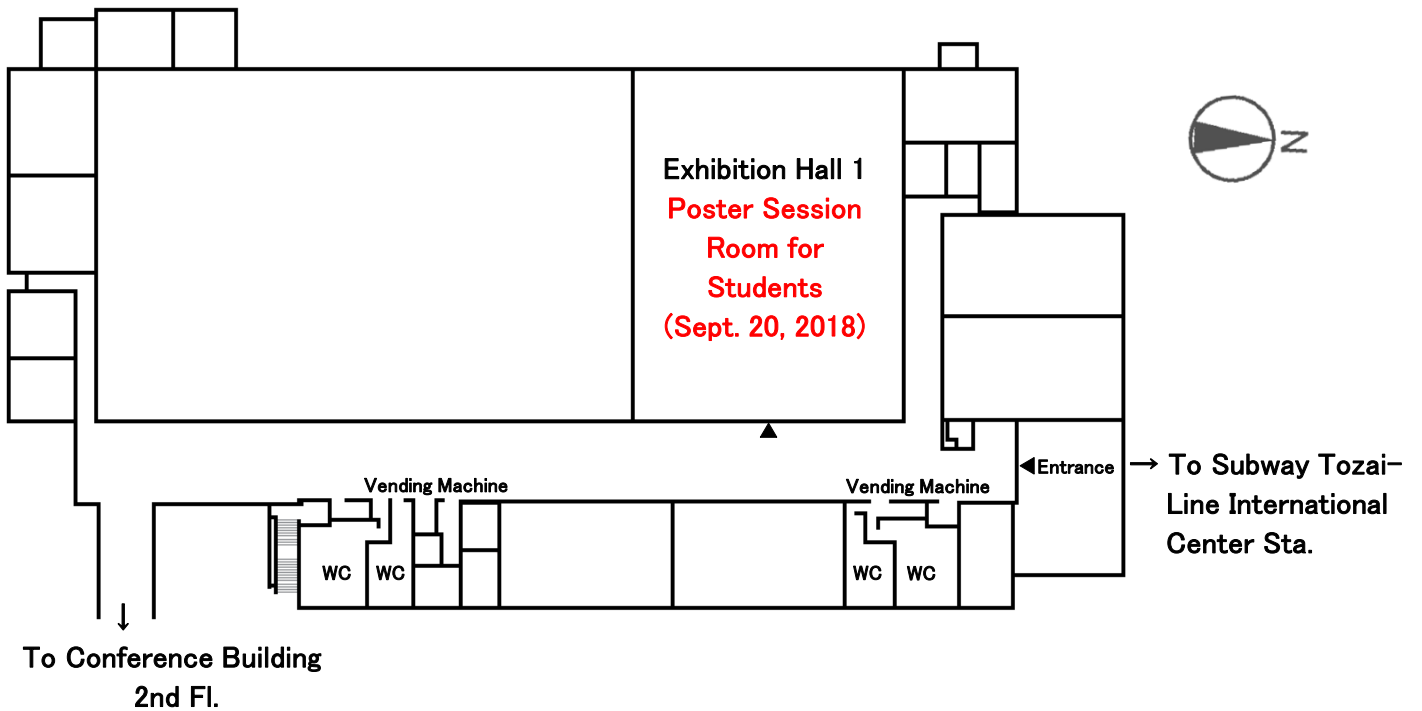
## Tohoku Univ. Kawauchi Campus, Lecture Rooms A·B·C



Tohoku Univ. Kawauchi Campus  
Multimedia Education and Research Complex 6th Fl.



Sendai International Center  
Exhibition Building



The timetable the 176th ISIJ Meeting  
(September 19–21, 2018 at Tohoku University, Kawauchi Campus)

Session Room	Sept. 19 (Wed.)		Sept. 20 (Thu.)		Sept. 21 (Fri.)		
	AM	PM	AM	PM	AM	PM	
Session Room 1 Kawauchi Lecture Rooms B101	Energy-Environment-Dust processing in ironmaking processes [Int.1-16] (8:50-17:10)		Iron ore sintering technology toward solving resources and environmental problems (10:00-16:50)[1,000yen]		Blast furnace/COURSE 50 [65-70] (9:30-11:40)	Sintering 1•2 [71-76] (13:00-15:10)	
Session Room 2 Kawauchi Lecture Rooms B102	---	Interim report of "Clean Cr steel production by slag, inclusion control" research group (13:00-17:30)[Charge-Free]	---	Coal and coke/Young engineer session of coke-making 1•2 [19-30] (12:30-16:50)	Fundamentals of reduction/ New iron source [77-84] (9:00-11:50)	Young engineer session of iron making [85-88] (13:00-14:20)	
Session Room 3 Kawauchi Lecture Rooms B104	Thermodynamics/ Transport phenomena [1-8] (9:00-11:50)	Solidification and structure control 1•2/Continuous casting and solidification [9-18] (13:00-16:40)	Converter/Physico-chemical properties, reactions, and transport of multiphase interfaces in matrix of high temperature melts related to refining processes 1 [31-38] (9:00-11:50)	Physico-chemical properties, reactions, and transport of multiphase interfaces in matrix of high temperature melts related to refining processes 2•3 [39-48] (13:00-16:30)	---	---	
Session Room 4 Kawauchi Lecture Rooms A105	---	---	Novel processing/ Introduction of research topics in novel processing forum [49-56] (9:00-11:50)	Application of direct observation method to novel processings/ Refractories [57-64] (13:30-16:20)	Slag and dust treatment/Slag [89-102] (9:30-12:00)	Elution from slag 1•2 [93-99] (13:00-15:30)	
Session Room 5 Kawauchi Lecture Rooms A106	---	Value assessment with burden assessment for steel (13:00-17:00)[Charge-Free]	---	Present conditions and maintenance for aging infrastructure IV (13:20-17:00)[Charge-Free]	Cultural heritage [103-106] (10:00-11:20)	---	
Session Room 6 Multimedia Education and Research Complex M601-1	---	---	Advanced abnormality diagnoses based on area sensing technologies [D1-D5] (9:15-11:45)	Human-system shared control realizing high efficient and stable rolling [D6-D10] (13:00-15:45)	System [107-110] (16:00-17:20)	Instrumentation/Control [111-118] (9:00-11:50)	System model of resilience and its application [D11-D15] (13:00-14:50)
Session Room 7 Kawauchi Lecture Rooms A404	---	Cutting edge of research for weld metal 1•2 [119-127] (13:00-16:10)	Numerical simulation of leveling and straightening of metal [D16-D22] (9:00-12:00)	The technical session by young engineers of hot rolling 1•2/ Cooling and tribology [140-151] (13:00-17:20)	Current research and development in cold sheet metal forming simulation [D23-D27] (10:20-15:00)		
Session Room 8 Kawauchi Lecture Rooms A406	---	Control technology for free cutting-12/Modeling of various phenomena in metal forming and its application 1•2 [128-139] (13:00-17:20)	Argument on the history of ironmaking in the Tohoku where has taken the lead in the ironmaking technology in Japan (10:00-17:00)[2,000yen, Student: 1,000yen]		Deformation and forming/ Coating fabrication [152-157] (9:20-11:30)	Symposium on viscous flow processing of Fe-based metallic glass micro-particles (12:39-16:30)[Charge-Free]	
Session Room 9 Kawauchi Lecture Rooms B201	Modeling and simulation/ Phase diagram [158-165] (9:10-12:00)	Machine structural steel [166-170] (13:00-14:40)	Heterogeneous structure control: Towards innovative development of metallic structural materials (9:30-16:45)[Charge-Free]		Surface technology 1•2 [263-270] (9:00-11:50)	Hot-dip coating/Mechanism of corrosion and corrosion protection [271-280] (13:00-16:30)	
Session Room 10 Kawauchi Lecture Rooms B202	Diffusional transformation 1•2 [171-178] (9:00-11:50)	$\gamma$ - $\alpha$ transformation/ Reversed transformation and eutectic transformation/ Recrystallization and grain growth [179-188] (13:00-16:40)	Hydrogen embrittlement 1•2 [198-204] (9:20-11:50)	Hydrogen embrittlement 3•4•5 [205-215] (13:00-17:00)	Hydrogen embrittlement 6•7 [281-286] (9:30-11:40)	---	
Session Room 11 Kawauchi Lecture Rooms B203	New analytical approach for microstructural evolution (9:30-16:45)[Charge-Free]		Austenitic heat resistant steel 1•2 [216-223] (9:00-11:50)	Heat resistant alloy/ Ferritic heat resistant steel 1 [224-233] (13:30-17:00)	Ferritic heat resistant steels 2 [287-290] (9:00-10:20)	---	
Session Room 12 Kawauchi Lecture Rooms B204	---	High-strengthening theory in high-temperature materials (13:00-17:15)[Charge-Free]	Strength and deformation behavior 1•2 [234-241] (9:00-11:50)	Strength and deformation behavior 3•4 [242-250] (13:00-16:10)	Interface migration in iron-family-metal-base alloys (9:00-12:20)[Charge-Free]	Subjects considering microstructure control and material properties using secondary phase and solute segregation (13:30-16:10)[Charge-Free]	
Session Room 13 Kawauchi Lecture Rooms A101	---	Toughness/Fatigue 1•2 [189-197] (13:00-16:20)	Electrical steel [251-255] (10:00-11:40)	Stainless steels 1•2 [256-262] (14:00-16:30)	Aging and precipitation 1•2 [291-298] (9:00-11:50)	Investigation of bio-corrosion of structural materials ~diagnosis and analysis~ I [D28-D33] (13:20-16:20)	
Session Room 14 Kawauchi Lecture Rooms A102	ISIJ and JIM joint session Titanium and its alloys 1•2 [J1-J10] (10:00-14:20)		---	ISIJ and JIM joint session Titanium and its alloys 3 [J11-J16] (15:30-17:30)	ISIJ and JIM joint session Titanium and its alloys 4•5•6 [J17-J30] (9:00-15:00)		
Session Room 15 Multimedia Education and Research Complex M601-2	Analytical and sample pretreatment techniques for on-site/on-line analysis [299-302] (10:30-11:50)	New functionalities of iron and steelmaking slags by biofilm coating and their evaluation and characterization I (13:00-15:50)[Charge-Free]	Precipitate and inclusion analysis/Crystal structure analysis [303-310] (9:00-11:50)	Elemental analysis/ Surface and state analysis [311-317] (14:10-16:40)	Monitoring and analysis methods for industrial processes [Int.17-30] (8:50-16:30)		
JIM Session Room B Kawauchi Lecture Rooms C102	ISIJ and JIM joint session Ultrafine grained materials - fundamental aspects for ultrafine grained structures- 1•2 [J31-J35] (10:00-11:50)	---	---	---	---	---	
JIM Session Room R Kawauchi Lecture Rooms B103	---	ISIJ and JIM joint session Materials science of martensitic and bainitic transformations and its applications 1•2 [J36-J43] (14:10-17:00)	ISIJ and JIM joint session Materials science of martensitic and bainitic transformations and its applications 3•4•5•6•7 [J44-J63] (9:00-17:20)		ISIJ and JIM joint session Materials science of martensitic and bainitic transformations and its applications 8•9•10•11 [J64-J80] (9:00-16:10)		
*Banquet (18:30-20:30 Hotel Metropolitan Sendai)			*Poster Session for Students (12:00-16:00 Sendai International Center, Exhibition bldg., Exhibition Hall 1) *ISIJ Beer Party (17:30-19:00 Cafeteria "Kawauchi no Mori Dining" in Kawauchi Campus)				

[ ] : Lecture Number  
( ) : Lecture Time  
■ : Symposium: Please ask to each of symposium room desks directly

# Program of the 176<sup>th</sup> ISIJ Meeting (September 19-21, 2018)

## Instrumentation, Control and System Engineering

Lecture No. Discussion Sessions	Title	Speaker	Page
<b>Advanced abnormality diagnoses based on area sensing technologies</b>			
9:15-9:25	D1 Intelligent abnormality diagnosis for steel works by using adaptive area sensing	H. Tamaki	• • • 421
9:25-9:55	D2 Small vibration measurement of a structure using sampling moire camera	M. Fujigaki	• • • 422
9:55-10:25	D3 Wide-area small-vibration measurement using high-frame-rate panoramic images	I. Ishii	• • • 426
10:25-10:55	D4 State, parameter and input estimation for deterioration detection (A method assuming multi-channel output measurements)	T. Asai	• • • 429
10:55-11:25	D5 Bridge and conveyor failure discovery using an evaluation function to select variables and parameters with an area sensing method	I. Ono	• • • 431
<b>Human-system shared control realizing high efficient and stable rolling</b>			
13:05-13:35	D6 Human-system shared control realizing high efficient and stable rolling	A. Kitamura	• • • 435
13:35-14:05	D7 Characteristics of cold rolling in consideration of negative forward slip ratios	T. Shiraishi	• • • 438
14:05-14:35	D8 The notion and examples of shared control: The case of driving assistance	M. Itoh	• • • 440
14:45-15:15	D9 Analysis of latent structures in area-of-interest sequences to extract plant operation skills	Y. Horiguchi	• • • 444
15:15-15:45	D10 Basic and recent trend of reinforcement learning	S. Shirakawa	• • • 448
<b>System model of resilience and its application</b>			
13:10-13:30	D11 A fundamental study on system model of resilience	N. Fujii	• • • 451
13:30-13:50	D12 A study on risk evaluation of supply chain from a viewpoint of suppliers	I. Hatono	• • • 454
13:50-14:10	D13 Agent based anomaly detection method in production facility network using pheromone	S. Hong	• • • 458
14:10-14:30	D14 Variability analysis of a steel production line with an extended model of functional resonance analysis method for the design of resilient socio-technical systems	T. Hirose	• • • 462
14:30-14:50	D15 Scenarios to evaluate the actions against unexpected situations	M. Takahashi	• • • 466

## Processing for Quality Products

Lecture No. Discussion Sessions	Title	Speaker	Page
<b>Numerical simulation of leveling and straightening of metal</b>			
9:10-9:30	D16 Improvement of springback prediction for high strength steel sheets by sophistication of material model	S. Sumikawa	• • • 470
9:30-9:50	D17 Review of the leveling process technology in sheet and coil	Y. Maeda	• • • 472
9:50-10:10	D18 Prediction and evaluation of residual stress after leveling process	K. Hayakawa	• • • 476
10:10-10:30	D19 FE analysis of influence of wave length on flattening of wavy edges during roller leveling	J. Negami	• • • 479
10:40-11:00	D20 Influence of incoming curvature on robustness of roller leveling effect	T. Higo	• • • 481
11:00-11:20	D21 In-plane cyclic deformations of sheet metals and its modeling	T. Uemori	• • • 485
11:20-11:40	D22 Steady state tension leveling FE simulation and its application to optimization problem	H. Hamasaki	• • • 489

# Program of the 176<sup>th</sup> ISIJ Meeting (September 19-21, 2018)

## Current research and development in cold sheet metal forming simulation

10:25-11:10

D23 Constitutive models of elasto-plasticity for sheet metal forming simulation  
(Descriptions of the Bauschinger effect and anisotropy evolution) F. Yoshida . . . 492

11:10-11:55

D24 Enhancement of the accuracy of material models and numerical simulations for steel sheets by  
advanced material testing methods T. Kuwabara . . . 496

13:00-13:30

D25 Effect of anisotropy evolution on circular and oval hole expansion behavior of high-strength steel sheets T. Suzuki . . . 500

13:30-14:00

D26 Improvement in shape accuracy of press-formed parts with springback cause analysis M. Urabe . . . 504

14:00-14:45

D27 (Invited Lecture) Recent applications and the future direction of stamping simulation  
in Toyota Motor Co. N. Ichijo . . . 508

## Microstructure and Properties of Materials

Lecture No.

Discussion Sessions Title

Speaker

Page

### Investigation of bio-corrosion of structural materials ~diagnosis and analysis~I

13:20-13:45

D28 (ISIJ Research Promotion Grant) Cathodic electron flow in the corrosion by iron-corrosive methanogen S. Wakai . . . 510

13:45-14:10

D29 Effect of nitrate addition on souring control under the presence of nitrate- and sulfate-reducing bacteria K. Miyanaga . . . 513

14:10-14:35

D30 Microbiologically influenced corrosion of carbon steel in soil R. Hayashi . . . 515

14:50-15:15

D31 Relationship between the amount of mixed - culture biofilm and the initiation of corrosion on  
stainless steel weldment T. Wada . . . 516

15:15-15:40

D32 Effect of addition of glutaraldehyde in the solution on biofilm observation by SICM N. Hirai . . . 519

15:40-16:05

D33 (ISIJ Research Promotion Grant) Effect of microbe and ferrous ion concentration on pitting  
corrosion initiation of stainless steel in artificial marine water Y. Miyano . . . 520

# Program of the 176<sup>th</sup> ISIJ Meeting (September 19-21, 2018)

## International Organized Sessions

### High Temperature Processes / Environmental, Energy and Social Engineering

#### Energy-Environment-Dust processing in ironmaking processes

Session organizer : H. Nogami [Tohoku Univ.], T. Murakami [Tohoku Univ.], T. Usui [Osaka Univ.]

8:50-8:55

Opening Address: H. Nogami [Tohoku Univ.]

Chair: T. Usui [Osaka Univ.]

8:55-9:20

**Int.-1** (Invited Lecture) Biogas: how we can reduce environmental impact in the iron and steel industry

Federal Univ. of Ouro Preto ○P. S. Assis, REDEMAT K. O. Calixto,

Federal Univ. of Ouro Preto M. E. Martins

• • • 521

9:20-9:45

**Int.-2** (Invited Lecture) Rising the efficiency of fossil and renewable energy carriers in the blast furnace

RWTH Aachen Univ. ○A. Babich · D. Senk

• • • 524

9:45-10:10

**Int.-3** Carbon requirement for ironmaking under carbon and hydrogen co-existing atmosphere

Tohoku Univ. ○H. Nogami

• • • 526

10:10-10:35

**Int.-4** Simultaneous carbonization and pulverization behaviors of biomass in the rapid carbonization process applying heat storage materials

Tohoku Univ. ○D. Maruoka · T. Nakamura · H. Sumikawa · T. Murakami · E. Kasai

• • • 528

10:35-11:00

**Int.-5** Improvements on coking process time and coke quality by coal moisture control

REDEMAT ○P. S. Assis · M. C. Carias, ENVIROX M. C. R. Oliveira, GERDAU G. L. R. Silva

• • • 530

Chair: T. Murakami [Tohoku Univ.]

11:10-11:35

**Int.-6** (Invited Lecture) Use of biochar and biogas as fuel for iron ore sintering in a small machine

Federal Fluminense Univ. ○J. A. Castro · E. M. Oliveira · M. F. Campos

• • • 534

11:35-12:00

**Int.-7** Effect of magnetite on initial melt formation in sintering process

Kyushu Univ. ○Z. Wang, OECD Nuclear Energy Agency H. Ogi,

Kyushu Univ. K. Ohno · T. Maeda · K. Kunitomo

• • • 536

13:10-13:35

**Int.-8** (Invited Lecture) Use of different particle size pellet feeds on granulation behavior in the sintering process

Federal Univ. of Minas Gerais ○M. C. Bagatini · R. A. Lopes Jr. · I. V. Flores · A. F. L. Oliveira

• • • 538

13:35-14:00

**Int.-9** Agglomeration of return fines of sinter for blast furnace raw materials

JFE ○Y. Ogasawara · T. Sato · J. Ishii · R. Murai · S. Watakabe

• • • 540

14:00-14:25

**Int.-10** (Invited Lecture) Modeling breakage and mechanical degradation of steelmaking materials during handling

Federal Univ. of Rio de Janeiro ○R. M. Carvalho · P. P. S. Cavalcanti · L. M. Tavares

• • • 542

Chair: H. Nogami [Tohoku Univ.]

14:35-15:00

**Int.-11** (Invited Lecture) Kinetics of methane reforming for direct reduction of iron

Inst. Tech. Research ○T. R. Ribeiro, Univ. of Sao Paulo C. Takano, Univ. Center of FEI J. G. R. Poço,

Inst. Tech. Research J. B. F. Neto, Norwegian Univ. of Sci. Tech. L. Kolbeinsen, SINTEF E. Ringdalen

• • • 546

15:00-15:25

**Int.-12** Ethanol-assisted ironmaking of mild-dehydrated goethite-contained ore

Hokkaido Univ. ○A. Kurniawan · T. Akiyama · T. Nomura · K. Abe

• • • 550

15:25-15:50

**Int.-13** (Invited Lecture) Economic feasibility for reducing iron by electrolysis

Federal Fluminense Univ. ○M. F. Campos · J. A. Castro

• • • 552

15:50-16:15

**Int.-14** Evaluation of carbonization gas from coal and woody biomass and reduction rate enhancement of carbon composite iron oxide pellets by using semi-char and semi-charcoal

Osaka Univ. ○T. Usui · H. Konishi, JFE K. Ichikawa, Univ. of Toyama H. Ono,

Osaka Univ. H. Kawabata, Federal Univ. of Ouro Preto F. B. Pena · M. H. Souza · A. A. Xavier · P. S. Assis

• • • 554



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16:15-16:40

**Int.-15** Experimental research on the dust emission of raw materials in a steel plant stockyard

Baoshan Iron & Steel Co., Ltd ○H. Li, Tongji Univ. H. Yang,  
Baoshan Iron & Steel Co., Ltd W. Wei · Y. Zhang

· · · 556

16:40-17:05

**Int.-16** Practices and analysis of gas dedusting for blast furnaces in Baosteel

Baoshan Iron & Steel Co., Ltd ○C. Wang · Y. Chen

· · · 560

17:05-17:10

Closing Remark: T. Usui [Osaka Univ.]

## Process Evaluation and Material Characterization

### Monitoring and analysis methods for industrial processes

Session organizer : Y. Deguchi [Tokushima Univ.], S. Kashiwakura [Tohoku Univ.]

8:50-9:00

Opening Address: Y. Deguchi [Tokushima Univ.]

Chair: Y. Deguchi [Tokushima Univ.]

9:00-9:30

**Int.-17** (Invited Lecture) Analysis of cluster formation reactions in laser-induced plasma for LIBS measurement

Kyoto Univ. ○T. Sakka

· · · 564

9:30-10:00

**Int.-18** (Invited Lecture) Quantification for laser-induced breakdown spectroscopy

Tsinghua Univ. ○Z. Wang

· · · 565

10:00-10:30

**Int.-19** (Invited Lecture) Improved LIBS detection ability for underwater measurement of solid samples

Xi'an Jiaotong Univ. ○Z. Wang

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10:40-11:10

**Int.-20** (Invited Lecture) Laser induced breakdown spectroscopy for fast quantitative analysis of elemental composition in manufacturing processes

Gwangju Institute of Science and Technology ○S. Jeong

· · · 568

11:10-11:40

**Int.-21** (Invited Lecture) Combining LIBS and FTIR for the analysis of coal components

South China Univ. of Technology ○S. Yao

· · · 571

11:40-12:00

**Int.-22** Perspectives for rare-earth recycling

Federal Fluminense Univ. ○M. De Campos, UFF - Universidade Federal Fluminense J. Castro

· · · 573

12:00-12:20

**Int.-23** Determination of manganese in steels with a combination of laser-induced breakdown spectroscopy and partial-least-square regression

Tohoku Univ. ○S. Kashiwakura · K. Wagatsuma

· · · 574

Chair: S. Kashiwakura [Tohoku Univ.]

13:10-13:40

**Int.-24** (Invited Lecture) Laser-induced breakdown spectroscopy in the aluminum industry

Chinese Academy of Sciences ○L. Sun

· · · 576

13:40-14:10

**Int.-25** (Invited Lecture) Use of a generalized spectrum and machine learning in LIBS data treatment for quantitative elemental analysis of soils

Shanghai Jiao Tong Univ. ○J. Yu

· · · 579

14:10-14:40

**Int.-26** (Invited Lecture) Study on high-precision analysis of steel and iron ore content in laser-induced breakdown spectroscopy

Huazhong Univ. of Science and Technology ○L. Guo

· · · 580

14:50-15:20

**Int.-27** (Invited Lecture) Laser remote analysis for decommissioning of Fukushima Daiichi nuclear power station

Japan Atomic Energy Agency ○I. Wakaida · H. Ohba · K. Akaoka · M. Miyabe · M. Oba,  
Institute for Molecular Science T. Taira

· · · 581

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15:20-15:40

**Int.-28** Fundamental aspects of fiber-optic long-pulse laser-induced breakdown spectroscopy in air

Univ. of Hyogo ○A. Matsumoto

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584

15:40-16:00

**Int.-29** Quantitative elemental measurement of steel samples using long and short DP-LIBS

Xi'an Jiaotong Univ. ○M. Cui, Tokushima Univ. Y. Deguchi · Y. Fujita · S. Tanaka,

Xi'an Jiaotong Univ. Z. Wang, National Twaiwan Univ. of Science and Technology F. Shiou

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587

16:00-16:20

**Int.-30** LIBS applications to steel and iron making processes

Tokushima Univ. ○Y. Deguchi · M. Cui · Y. Fujita · S. Tanaka, Xi'an Jiaotong Univ. Z. Wang,

National Twaiwan Univ. of Science and Technology F. Shiou

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16:20-16:30

Closing Address: Y. Deguchi [Tokushima Univ.]

# Program of the 176<sup>th</sup> ISIJ Meeting (September 19-21, 2018)

## High Temperature Processes

Lecture No.	Title	Speaker	Page
<b>Plenary Session</b>			
<b>Thermodynamics</b>			
1	Measurement of deoxidation equilibria and $\text{Al}_2\text{O}_3/\text{MnAl}_2\text{O}_4$ doubly-saturated composition for Fe-Mn-Al melt at steelmaking temperature	R. Nishigaki	591
2	Phase equilibrium between Fe-Cr-Mn-S alloy and FeS-CrS-MnS sulfide	K. Takahashi	592
3	Solubility of oxygen in molten Ni-Cr alloy in equilibrium with Cr oxide in slag	Y. Miyazaki	593
4	In-situ observation of $\text{Fe}_3\text{C}$ formation in the reduction of $\text{Fe}_2\text{O}_3$ by $\text{CO}_2$ -CO using high temperature XRD	Y. Sasaki	594
<b>Transport phenomena</b>			
5	Morphology changes during the reduction of $\text{Na}_2\text{O}$ -doped $\text{Fe}_2\text{O}_3$ compacts	W. Pan	595
6	Simulation of gas-liquid surface behavior with particle injection into a water bath	S. Sato	596
7	Effect of mechanical stirring power on behavior of injected gas in refining process	K. Wang	597
8	Investigation of melt interface deformation in KR method by a water model experiment and large-scale simulation	Y. Fang	598
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