

The timetable the 174th ISIJ Meeting  
(September 6-8, 2017 at Hokkaido University, Sapporo Campus)

No.	Session Room	Sept. 6 (Wed.)		Sept. 7 (Thu.)		Sept. 8 (Fri.)	
		AM	PM	AM	PM	AM	PM
1	Inst. for the Advancement of Higher Education 2nd Fl. E214	Recent progress in technologies of analysis and measurements for cohesive zone phenomena in blast furnace (9:10-16:00) [Charge-free]		Blast furnace/Reduction of sinter [50-57] (9:10-12:00)	Young engineer session of iron making 1-2-3 [58-67] (13:00-16:40)	Agglomeration/Sintering [125-133] (9:00-12:10)	Environmental technology in sintering/ Fundamentals of sintering [134-141] (13:00-15:50)
2	Inst. for the Advancement of Higher Education 2nd Fl. E215	Microwave processing/ Novel processing/Electromagnetic processing of materials [1-9] (9:00-12:20)	Introduction of research topics in novel processing forum/Application of direct observation to novel processings 1-2 [10-19] (13:10-16:50)	Coke fundamentals/Young engineer session of coke-making 1 [68-76] (9:00-12:10)	Young engineer session of coke-making 2/Coke making/Coke facility [77-87] (13:10-17:10)	Softening*Carburization*Melting [142-144] (9:00-10:00)	---
3	Inst. for the Advancement of Higher Education 3rd Fl. N304	---	---	---	Cutting-edge approaches from multidiscipline fields for comprehension of high temperature phenomena and materials design 1-2-3 [88-97] (13:00-16:40)	---	---
4	Inst. for the Advancement of Higher Education 2nd Fl. E201	Transport phenomena 1-2 [20-25] (9:30-11:40)	Thermodynamics 1-2 [26-35] (13:00-16:30)	Hot metal treatment/ Converter and electric furnace [98-104] (9:30-12:00)	Inclusion/Secondary refining [105-112] (13:30-16:20)	Reactions of refractory with steel and/or slag during steel refining 1-2 [145-150] (9:30-11:40)	Reactions of refractory with steel and/or slag during steel refining 3-4-5 [151-159] (12:40-16:00)
5	Inst. for the Advancement of Higher Education 2nd Fl. E208	Solidification and structure control [36-40] (10:00-11:40)	Continuous casting*Solidification 1-2-3 [41-49] (13:00-16:20)	---	Estimation of thermophysical properties of materials related to casting and solidification processes 1-2-3 [113-124] (12:50-17:10)	Slag and dust [160-163] (10:00-11:20)	---
6	Inst. for the Advancement of Higher Education 2nd Fl. E207	Green processing [164-168] (10:00-11:40)	Advanced application of secondary resources, by-products and energy in pyroprocessing industry 1-2-3 [169-179] (13:00-17:00)	Current situation and issues of environmental conservation using iron- and steelmaking slags (9:00-12:00) [Charge-free]	Characterization and analysis of biofilm formation processes on various substrates such as iron and steel slag and its effective utilization (13:00-15:40) [Charge-Free]	Elucidation and development of control technology for factors which induce biocorrosion of structural material-II [D12-D17] (9:20-12:20)	---
7	Inst. for the Advancement of Higher Education 2nd Fl. E206	---	The dawn of the industrial steel making in Japan and France [Int.-1-Int.-6] (13:00-16:30)	Elemental technologies for "Effective use of unutilized energy in steelworks" (9:00-17:00) [Charge-free]		---	---
8	Inst. for the Advancement of Higher Education 3rd Fl. N302	---	---	Culture of iron in Hokkaido (10:30-17:20) [2,000yen]		---	---
9	Inst. for the Advancement of Higher Education 3rd Fl. E317	---	---	Advanced abnormality diagnoses based on area sensing technologies [D1-D5] (9:30-12:00)	Instrumentation and control technology in the steel industry: recent developments and future perspectives [Int.-7-Int.-14] (13:00-17:00)	Instrumentation 1-2 [180-186] (9:30-12:00)	Control and system [187-190] (13:00-14:20)
10	Inst. for the Advancement of Higher Education 3rd Fl. E318	Strength, deformation behavior/ Fundamental studies on rolling tribology [191-197] (9:30-12:00)	Camber, skew and chattering in rolling [D6-D11] (13:30-17:00)	Advanced manufacturing technology of steel products [Int.-15-Int.-24] (10:00-17:10)		To solve problems of hot rolling rolls (9:00-11:50) [Charge-free]	Modeling of various phenomena in metal forming and its application 1-2 [231-236] (13:00-15:10)
11	Inst. for the Advancement of Higher Education 3rd Fl. E319	Control technology for free cutting 11/ Rolling-Cooling [198-205] (9:00-11:50)	Cutting edge of welding phenomena with high-strength steel 1-2/ Fracture characteristics [206-214] (13:00-16:20)	Rolling/Advances in processing of powders and powder metallurgy [215-221] (9:30-12:00)	The technical session by young engineers of hot rolling 1-2 [222-230] (13:30-16:40)	Numerical analysis of deformation/ Fracture characteristics and semi solid processing [237-242] (9:30-11:40)	Surface treatments and application [243-246] (13:00-14:20)
12	Inst. for the Advancement of Higher Education 3rd Fl. E310	Hydrogen embrittlement 1-2 [247-252] (9:20-11:30)	Hydrogen embrittlement 3-4-5 [253-263] (13:00-17:00)	Fundamental factors and characteristics evaluation of hydrogen embrittlement midterm report (9:00-17:00) [2,000yen]		Hydrogen embrittlement 6-7 [416-422] (9:00-11:30)	Hydrogen embrittlement 8-9 [423-427] (13:00-14:50)
13	Inst. for the Advancement of Higher Education 3rd Fl. E311	---	---	ISSS2017 Pre-Symposium Characterization and design of multiscale heterostructures in advanced steels (9:00-16:30) [Charge-free]		---	---
14	Inst. for the Advancement of Higher Education 3rd Fl. E312	---	Electrical steel/Cold strips [264-271] (13:00-15:50)	Machine structural steel 1 [329-333] (9:30-11:10)	Machine structural steel 2-3/Tool steel [334-342] (13:30-16:40)	Evaluation of stability and deformation/transformation behavior of austenite (8:45-12:15) [1,000yen]	---
15	Inst. for the Advancement of Higher Education 3rd Fl. E313	---	---	Ductile and brittle fracture 1 [343-347] (10:00-11:40)	Ductile and brittle fracture 2/ Fatigue property [348-355] (13:30-16:20)	Recent advancement of studies on phase transformation and precipitation in titanium alloys-II (9:00-15:00) [Charge-free]	
16	Inst. for the Advancement of Higher Education 3rd Fl. E314	---	Strength and deformation 1-2-3 [272-283] (12:50-17:10)	---	Strength and deformation 4-5 [356-365] (13:00-16:30)	---	---
17	Inst. for the Advancement of Higher Education 3rd Fl. E315	Diffusional and diffusionless transformation 1-2 [284-289] (9:50-12:00)	Diffusional and diffusionless transformation 3-4/ Thermo-mechanical heat treatment [290-300] (13:00-17:00)	Stainless steels 1 [366-369] (10:00-11:20)	Stainless steels 2-3 [370-379] (13:00-16:30)	Hot-dip coating/Mechanism of corrosion/ Surface technology [428-435] (9:00-11:50)	---
18	Inst. for the Advancement of Higher Education 3rd Fl. E308	ISIJ and JIM joint session Materials science of martensitic and bainitic transformations and its applications 1 [J40-J44] (10:20-12:00)	ISIJ and JIM joint session Materials science of martensitic and bainitic transformations and its applications 2-3-4 [J45-J55] (13:00-17:00)	ISIJ and JIM joint session Materials science of martensitic and bainitic transformations and its applications 5 [J56-J59] (10:30-11:50)	ISIJ and JIM joint session Materials science of martensitic and bainitic transformations and its applications 6 [J60-J63] (13:00-14:20)	ISIJ and JIM joint session Materials science of martensitic and bainitic transformations and its applications 7-8 [J64-J71] (9:00-11:50)	ISIJ and JIM joint session Materials science of martensitic and bainitic transformations and its applications 9-10 [J72-J79] (13:00-15:50)
19	Inst. for the Advancement of Higher Education 3rd Fl. E307	---	Aging and precipitation/Phase diagram and diffusion/Inclusion [301-311] (13:00-17:00)	Modeling and simulation 1-2 [380-387] (9:00-11:50)	Recovery and recrystallization/ Texture/ Grain boundary [388-398] (13:00-17:00)	---	---
20	Inst. for the Advancement of Higher Education 3rd Fl. E301	Ferritic heat resistant steels 1-2 [312-319] (9:00-11:50)	Ferritic heat resistant steels 3-4 [320-328] (13:00-16:10)	Heat resistant alloys 1-2 [399-406] (9:00-11:50)	Austenitic heat resistant steels 1-2 [407-415] (13:00-16:10)	---	---
21	Inst. for the Advancement of Higher Education 3rd Fl. E306	Organic compound analysis [436-439] (10:00-11:20)	Elemental analysis 1-2 [440-445] (13:00-15:10)	Precipitate & inclusion analysis/ Crystal structure analysis [446-452] (9:00-11:30)	Characterization of microstructure/heterogeneity of steel and relating materials using quantum beams and relating advanced observation techniques (13:00-16:30) [Charge-free]	Symposium on 20th anniversary of the technical division of Process Evaluation & Material Characterization - Part II (9:00-12:10) [Charge-free]	
JIM-Session Room Q	Faculty of Engineering 3rd Fl. N304	ISIJ and JIM joint session Titanium and titanium alloys 1 [J1-J6] (10:00-12:00)	---	ISIJ and JIM joint session Titanium and titanium alloys 2-3-4-5 [J7-J21] (11:10-17:20)		ISIJ and JIM joint session Titanium and titanium alloys 6-7 [J22-J29] (9:00-11:45)	---
JIM-Session Room N	Faculty of Engineering 3rd Fl. N301	---	---	---	---	ISIJ and JIM joint session Ultrafine grained materials-fundamental aspects for ultrafine grained structures 1-2-3-4 [J30-J39] (9:00-13:40)	
		*Banquet (18:00-20:00 Kirin Beer Garden Honkan Nakajima Park store) [6,000yen]		*Poster Session for Students (12:00-16:00 Frontier Research in Applied Sciences Building) *ISIJ Beer Party (17:30-19:00 Cafeteria (Hokubu Shokudo)) [1,000yen]			

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

# Program of the 174<sup>th</sup> ISIJ Meeting (September 6-8, 2017)

## Instrumentation, Control and System Engineering

Lecture No.			
Discussion Sessions	Title	Speaker	Page
<b>Advanced abnormality diagnoses based on area sensing technologies</b>			
9:30-9:40			
D1	Intelligent abnormality diagnosis for steel works by using adaptive area sensing	H. Tamaki	• • • 470
9:40-10:10			
D2	Structural vibration identification of bridges by 3D measurement FE analysis and the actual vibration measurement	H. Matsuda	• • • 471
10:10-10:40			
D3	State and parameter estimation for deterioration detection	T. Asai	• • • 475
10:40-11:10			
D4	Conveyor failure discovery and evolutionary computation method for black box function optimization	S. Kurahashi	• • • 477
11:10-11:40			
D5	Time series displacement measurement of a structure using sampling moire method	M. Fujigaki	• • • 481

## Processing for Quality Products

Lecture No.			
Discussion Sessions	Title	Speaker	Page
<b>Camber, skew and chattering in rolling</b>			
13:35-14:20			
D6	(Invited Lecture) Properties and measures to chattering vibration in strip rolling	H. Honjo	• • • 485
14:20-14:50			
D7	Numerical model of chattering phenomena on cold tandem mill	Y. Maeda	• • • 489
14:50-15:20			
D8	Mechanism of deformation in roll bite in asymmetric rolling	D. Nikkuni	• • • 493
15:30-15:50			
D9	Numerical simulation of sheet crash	K. Komori	• • • 497
15:50-16:20			
D10	Strip walking control technology in hot strip finishing mill	Y. Washikita	• • • 498
16:20-16:50			
D11	LATERAL walking instability on coiling	S. Aoe	• • • 502

## Microstructure and Properties of Materials

Lecture No.			
Discussion Sessions	Title	Speaker	Page
<b>Elucidation and development of control technology for factors which induce biocorrosion of structural material-II</b>			
9:25-9:50			
D12	Analysis of microbial consortia for the steel corrosion in the soil	K. Miyanaga	• • • 506
9:50-10:15			
D13	Microbiologically influenced corrosion of carbon steel in soil	R. Hayashi	• • • 507
10:15-10:40			
D14	Observation on indigenous bacteria biofilms by scanning ion conductance microscopy	N. Hirai	• • • 508
10:55-11:20			
D15	The relationship between microstructure of stainless steel and the site bacteria initially attach to	T. Ueda	• • • 509
11:20-11:45			
D16	Biofilm structure and pit initiation on SUS304 stainless steel weldments	H. Kawakami	• • • 512
11:45-12:10			
D17	(ISIJ Research Promotion Grant) Effect of post-weld surface treatment of stainless steel welds on micro biologically influenced corrosion	Y. Miyano	• • • 515

# Program of the 174<sup>th</sup> ISIJ Meeting (September 6-8, 2017)

## International Organized Sessions

### Environmental, Energy and Social Engineering

#### The dawn of the industrial steel making in Japan and France

13:00-13:05

Opening Address: M. Tanaka [Showa Women's Univ.]

Chair: S. Nomura [Nippon Steel & Sumitomo Metal]

13:05-13:35

**Int.-1** (Invited Lecture) The appearance and diffusion of the indirect iron and steel-making process during the Middle Age and beginning of the modern period in Europe (XIVth - XVIIth c.)

CNRS ○P. Dillmann

• • • 516

13:35-14:05

**Int.-2** (Invited Lecture) Iron and steel making processes in France during the 18th and 19th centuries

Paris East Univ. (UPE) ○I. Guillot

• • • 518

Chair: T. Nakanishi [Kyushu Univ. Museum]

14:10-14:40

**Int.-3** (Invited Lecture) Japan's industrial revolution caused by colony acquisition competition

Iwate Univ. ○H. Onodera

• • • 522

14:40-15:10

**Int.-4** (Invited Lecture) Yokosuka steel works shipyard and Yokohama steel works : The process of technology transfer from France to Japan

EHESS ○C. Polak

• • • 526

Chair: M. Sakurai [JFE Kankyo]

15:20-15:50

**Int.-5** (Invited Lecture) To look and to learn: Yawata Steel Works in the practical training reports (Jisshu Houkoku) of Meiji Engineers

CNRS ○A. Kobiljski

• • • 527

15:50-16:20

**Int.-6** Acceptance of blast furnace engineering technology and development of domestic technology in the government-operated Yawata Steel Works -- The dawn of the industrial steel making in Japan --

Nippon Steel & Sumikin Technology ○M. Naito · H. Kanashima, Nippon Steel & Sumitomo Metal S. Nomura

• • • 528

16:20-16:25

Concluding Remarks: A. Kobiljski [CNRS]

16:25-16:30

Closing Address: S. Nomura [Nippon Steel & Sumitomo Metal]

### Instrumentation, Control and System Engineering

#### Instrumentation and control technology in the steel industry: recent developments and future perspectives

13:00-13:05

Opening Remarks A. Kitamura [Tottori Univ.]

Chair: A. Morita [Nippon Steel & Sumitomo Metal]

13:05-13:35

**Int.-7** (Invited Lecture) Dynamic optimization, Estimation and control of electric arc furnace operation

McMaster Univ. ○C. Swartz

• • • 531

13:35-14:00

**Int.-8** (Invited Lecture) Self-learning control method for alloying-element weight of refining furnace

China Univ. of Geosciences, Tokyo Institute of Technology ○J. An, Tokyo Institute of Technology T. Terano

• • • 535

14:00-14:30

**Int.-9** (Invited Lecture) The digitalization of the steel industry with examples from continuous casting automation

Primetals Technologies Austria ○K. Herzog · T. Kuehas, Primetals Technologies Germany G. Winter

• • • 536

14:30-14:55

**Int.-10** (Invited Lecture) Future view of automation technologies for smart manufacturing in the steel industries

- Utilization of big data with IoT technologies -

TMEIC ○T. Horikawa · H. Imanari

• • • 540

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Chair: H. Narazaki [Kobe Steel]

15:10-15:40

**Int.-11** (Invited Lecture) Slab identification system by using deep learning  
HASRE, Beijing Jiaotong Univ. ○S. Won . . . 544

15:40-16:05

**Int.-12** Profile measurement of castings for quantifying scarfing depth  
Nippon Steel & Sumitomo Metal ○A. Hibi · Y. Konno . . . 548

16:05-16:30

**Int.-13** Metal defect classification with convolution neural networks  
Kobe Steel ○T. Morimoto · T. Ashida · Y. Wasa · A. Okamoto · R. Katayama . . . 552

16:30-16:55

**Int.-14** Innovation of quality control for steel products through data science  
JFE ○H. Shigemori . . . 554

16:55-17:00

Closing Remarks K. Asano [JFE]

## Processing for Quality Products

### Advanced manufacturing technology of steel products

10:00-10:10

Opening Address J. Yanagimoto [The Univ. of Tokyo]

Chair: J. Yanagimoto [The Univ. of Tokyo]

10:10-10:40

**Int.-15** (Invited Lecture) A focus on pre- and post-bite strain and their consequences in flat rolling  
MINES ParisTech ○P. Montmitonnet . . . 558

10:40-11:10

**Int.-16** Influence of sizing press condition on plan view pattern of sheet bar in hot strip mill  
JFE ○H. Goto · Y. Takashima · Y. Kimura · M. Miyake · K. Kabeya . . . 562

11:10-11:40

**Int.-17** Strip warpage behavior and mechanism in single roll driven rolling  
Nippon Steel & Sumitomo Metal ○D. Kasai · A. Komori · A. Ishii · K. Yamada,  
Nippon Steel & Sumikin Engineering S. Ogawa . . . 566

13:10-13:40

**Int.-18** (Invited Lecture) 3-D coupled FE analysis of deformation of the strip and rolls in flat rolling  
Pohang Univ. of Science and Technology ○S. Hwang . . . 568

13:40-14:10

**Int.-19** Process simulation for the manufacturing of hot coils with estimated balance between product quality and energy consumption  
Toshiba Mitsubishi-Electric Industrial Systems ○K. Ohara · M. Tsugeno · H. Imanari · K. Kitagoh . . . 572

14:10-14:40

**Int.-20** Development of on-line forward slip ratio models on the tandem cold strip mill  
Kobe Steel ○Y. Fujii · Y. Maeda . . . 575

Chair: A. Segawa [Kanazawa Institute of Technology]

15:00-15:30

**Int.-21** (Invited Lecture) Elastic anisotropy of dual-phase steels and its implications for springback  
Univ. of New Hampshire ○Y. Korkolis · N. Deng · C. Dunn . . . 579

15:30-16:00

**Int.-22** New attempts for fracture prediction in metal forming: Construction of a novel material model based on strain-rate dependency and non-associated flow rule  
Keio Univ. ○T. Oya . . . 583

16:10-16:40

**Int.-23** Improvement in springback prediction accuracy in press forming by modeling of anisotropic material behavior and tool deformation  
JFE ○A. Ishiwatari · J. Hiramoto, Tokyo Univ. of Agri. and Tech. T. Kuwabara . . . 587

16:40-17:10

**Int.-24** (Invited Lecture) Study on the effects of forming conditions on the forming behaviors of Cr-V-Mo tool steel during time-dependent thixoforging by physical simulation  
Chongqing Univ. ○Y. Meng, The Univ. of Tokyo S. Sugiyama · J. Yanagimoto . . . 591

# Program of the 174<sup>th</sup> ISIJ Meeting (September 6-8, 2017)

## High Temperature Processes

Lecture No. Plenary Session	Title	Speaker	Page
<b>Microwave processing</b>			
1	Relation between complex permittivity and electrical conductivity of Si substrate in MW region	H. Fukushima	• • • 595
2	Carbothermic reduction of FeS in the presence of lime using microwave heating	A. Amini	• • • 596
3	Development of microwave heating of mold flux	T. Kinoshita	• • • 597
<b>Novel processing</b>			
4	Influence of N <sub>2</sub> gas on formation of the oxide scale of Zircaloy-4 in SA condition	K. Hosoi	• • • 598
5	Influence of sacrificial-Core diameter on crack formation and self-healing near Ni-Al alloy microchannel wall	K. Chiba	• • • 599
6	Formation of high-voidage zone around Ni-Al microchannel lining layer	R. Yamane	• • • 600
<b>Electromagnetic processing of materials</b>			
7	Theoretical estimation of liquid metal velocity decrease in a packed bed by static magnetic field imposition	K. Iwai	• • • 601
8	Impact of fill ratio on temperature distribution and metal bath configuration in the electroslag remelting process with vibrating electrode	F. Wang	• • • 602
9	Flows induced by alternating magnetic field in a liquid metal layer	Y. Tasaka	• • • 603
<b>Introduction of research topics in novel processing forum</b>			
10	The design of the electromagnetic field for microwave heating in high temperature processing	K. Kashimura	• • • 604
11	Introduction to the study group of containerless materials processing -Synthesis of novel phosphor in La-W-O system-	J. Fukushima	• • • 605
12	Report of the activity of In-Process technology research group	T. Kozuka	• • • 606
13	Acceleration of dissolution rate of solid NaCl into molten salt by ultrasound irradiation	S. Ogino	• • • 607
<b>Application of direct observation to novel processings 1</b>			
14	Remained problems in MW processing and In-situ observations of temperature measurement	K. Kashimura	• • • 608
15	In-situ spectroscopic analysis of carbothermal reduction process of iron oxides during microwave irradiation	J. Fukushima	• • • 609
16	Agglomeration and removal of dispersed particles from liquid under ultrasound irradiation conditions	K. Okumura	• • • 610
<b>Application of direct observation to novel processings 2</b>			
17	Observation method of chemical reaction for Helmholtz resonance vessel design	A. Namiki	• • • 611
18	Flow field evaluation formed around convex part of solid-liquid interface by using electromagnetic force	Y. Kanazawa	• • • 612
19	Observation of Non-metallic molten liquid flow under electromagnetic induction	N. Yoshikawa	• • • 613
<b>Transport phenomena 1</b>			
20	Observation of plunging depth and surface wave caused by a top lance	S. Sato	• • • 614
21	Effect of swirl motion on liquid eruption from a bath subjected to bottom gas injection	S. Sato	• • • 615
22	Inclusion removal by bubble collision in swirling flow	Y. Tsukaguchi	• • • 616
<b>Transport phenomena 2</b>			
23	A three-phase comprehensive mathematical model of desulfurization in electroslag remelting process	Q. Wang	• • • 617
24	The influence of non-isothermal phenomenon on the optimization of tundish flow-control devices	H. Pan	• • • 618
25	The simulation of the continuous slag solidification process using SPH method	Y. Tsurukawa	• • • 619
<b>Thermodynamics 1</b>			
26	Development of thermodynamic model of SFCA phase	R. Murao	• • • 620
27	Experimental inspection of thermodynamic model of SFCA phase	T. Harano	• • • 621
28	Behavior of As in iron ore in ironmaking process	J. Park	• • • 622
29	Temperature dependence of substitution of Cl <sup>-</sup> for OH <sup>-</sup> in a clathrate compound Ca <sub>12</sub> Al <sub>14</sub> O <sub>32</sub> (OH) <sub>2</sub>	K. Tamaki	• • • 623
30	Relation between iron oxide activities and silicate network structures on the Na <sub>2</sub> O-SiO <sub>2</sub> -FeO <sub>x</sub> slags	K. Horita	• • • 624

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## Thermodynamics 2

31	Evaluation of amount of copper oxide dissolved into magnetite	K. Urata	• • •	625
32	Aluminum deoxidation equilibrium in Fe-Ni alloy at 1773 and 1873K	H. Fukaya	• • •	626
33	Thermodynamics of oxygen in molten Nd-Fe-B alloy	K. Noguchi	• • •	627
34	Investigation on interfacial reaction between Ti-bearing ultra low carbon steel and inner wall of submerged entry nozzle for continuous casting	J. Lee	• • •	628
35	Preparation of the gradient silicon steel by electrodeposition of molten salt	S. Xie	• • •	629

## Solidification and structure control

36	Application phase field method and statistic fluctuation to homogeneous interfaces (mechanisms behind $\delta$ - $\gamma$ massive-like transformation by computational materials science)	H. Fujiwara	• • •	630
37	Influence of Ti addition to massive-like transformation in 0.45C steel	K. Morishita	• • •	631
38	4D-CT measurement of volume change during the massive-like transformation in Fe-0.18mass%C steel	K. Morishita	• • •	632
39	Effect of solidification structure for center-line segregation	T. Muraio	• • •	633
40	Solidified structure at the enlarged region in the cross section of unidirectional solidification	H. Esaka	• • •	634

## Continuous casting • Solidification 1

41	Improvement of slab quality nearby start-up point with application of the "circular dam" at Kure No.2 slab caster	Y. Hiraga	• • •	635
42	Electrochemical method to prevent a Submerged Entry Nozzle (SEN) clogging	W. Kim	• • •	636
43	Effect of argon gas in the mold on the inclusions and pinholes in bloom	S. Kim	• • •	637

## Continuous casting • Solidification 2

44	(ISIJ Research Promotion Grant) Critical flow velocity of oil entrapment in oil-water stratified fluid	M. Zeze	• • •	638
45	Process technology development for 3rd generation AHSS steel through prediction of mold powder component change and initial solidification characterization	K. Kim	• • •	639
46	Estimation of the range of the equiaxed crystal generation near continuous cast bottom	M. Kakizaki	• • •	640

## Continuous casting • Solidification 3

47	Estimation method about closing of solidified shells when partially pressing internally unsolidified billet	D. Ogasawara	• • •	641
48	Simulation of crack initiation on the slab in continuous casting machine by FEM	K. Toishi	• • •	642
49	Improvement of bloom surface quality by optimization of third cooling	K. Mitsuishi	• • •	643

## Blast furnace

50	Effect of packed particle and blast on raceway generation in blast furnace (2nd report)	A. Shinotake	• • •	644
51	Mathematical modeling of Mei steel No 2 BF operation with coke oven gas injection	M. Chu	• • •	645
52	Effect of Mud properties on tapping performance of blast furnace	Y. Lee	• • •	646
53	Development of slag flowability prediction formula for blast furnace operation and its application	J. Shiau	• • •	647

## Reduction of sinter

54	Effects of temperature, CaO sources and Al <sub>2</sub> O <sub>3</sub> concentration on generation of acicular calcium-ferrite	H. Yamaguchi	• • •	648
55	Production and evaluation of sinter with high reducibility under high H <sub>2</sub> atmosphere	Y. Motomura	• • •	649
56	Influence of gas composition on the reducibility of Silico-ferrite of Calcium and Aluminum prepared by a solid state reaction	Y. Ohnuma	• • •	650
57	Reduction process of columnar SFCA in the blast furnace simulated temperature and atmosphere	B. Cai	• • •	651

## Young engineer session of iron making 1

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