

# The Timetable of the 164th ISIJ Meeting

	September 17 (Mon)		September 18 (Thu)		September 19 (Wed)	
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.
Room 1 Muse Bldg. 3F Room No.32	— — —	Sintering-1·2 [1-6] (13:00-15:10)	Reduction with hydrogen /Cokemaking-1 [29-36] (9:00-11:50)	Cokemaking-2 /Young engineer session of coke-making-1·2 [37-47] (13:00-17:00)	Fluidized bed and shaft furnace [89-92] (10:30-11:50)	Innovative agglomerates /Reduction behavior of raw materials [93-100] (13:00-15:50)
Room 2 Muse Bldg. 2F Room No.24	Fundamentals of Ironmaking [7-9] (9:00- 10:00)	(D) Reaction and flow control of solid-gas-liquid phases for designing low carbon operation of blast furnace [D1-10] (10:10-16:10)	(D) Improvement of the iron ore sintering process aiming at lowering its environmental load and energy saving [D11-21] (9:00-17:10)		Blast furnace /Young engineer session of ironmaking-1 [101-109] (9:00-12:10)	Young engineer session of ironmaking-2·3 [110-116] (13:20-15:50)
Room 3 Educ. Bldg.1 4F Room No.401	The history of iron making technology in western Japan (9:50-16:30) [2,000yen]		Thermophysical properties of high-temperature materials for advanced materials processing- 1·2 [48-56] (9:00-12:10)	Thermophysical properties of high-temperature materials for advanced materials processing- 3·4 [57-66] (13:00-16:30)	Hot metal treatment /Converter [117-124] (9:00-11:50)	Inclusion-1·2 [125-132] (13:00-15:50)
Room 4 Educ. Bldg.1 4F Room No.402	(Int.) Ancient and pre-modern production of iron and non-ferrous metals in Europe, Middle-East and Asia [Int.1-11] (9:00-17:00)		Steel refining and refractories-1·2 [67-74] (9:00-11:50)	Steel refining and refractories-3·4 /Secondary refining [75-84] (13:10-16:50)	Transport phenomena -1·2 [133-138] (9:00-11:10)	Novel processing /Introduction of research topics in novel processing forum [139-145] (13:00-15:30)
Room 5 Educ. Bldg.2 1F Lecture theater	Solidification and structure control /Solidification [10-18] (9:00-12:10)	Thermodynamics-1·2·3 [19-28] (13:00-16:40)	Formation mechanism and control of segregation (9:15-17:00) [Charge-free]		Conventional continuous casting-1·2·3 [146-154] (9:00-12:20)	— — —
Room 6 Educ. Bldg.2 1F Room No.103	The role of material industry aiming for efficient use of steel alloying elements in automobile recycling process (9:30-16:00) [2,000yen]		— — —	CO <sub>2</sub> reduction [85-88] (13:10-14:30)	— — —	— — —
Room 7 Educ. Bldg.2 4F Room No.403	(D) Establishment of smart iron-making system using active carbon recycling energy system technologies (iACRES) [D22-30] (8:45-12:20)	Surface modification for advanced and eco-friendly steel products (13:00-16:10) [1,000yen]	Slag utilization-1·2 [155-161] (9:00-11:30)	Pyro-metallurgy based metals separating and recycling-2 (13:00-16:40) [2,000yen]	Application of green energy-1·2 [162-170] (9:00-12:10)	— — —
Room 8 Sci. Res. Bldg.2 2F Room No.26	(D) Advanced process control techniques to achieve energy-conservation and low- carbon as well as high-quality stable production [D31-33] (9:30-12:00)	(D) Advanced system integration for facilitating "systems of operators' skills" in steel works [D34-37] (13:20-16:00)	Control /System [171-176] (9:30-11:40)	Instrumentation [177-180] (13:00-14:20)	— — —	— — —
Room 9 General Educ. North Annex Bldg. 4F Room No.41	Tribology /Rolling [181-187] (9:20-11:50)	Cooling-1·2 [188-195] (13:30-16:20)	Joining and bonding /Tube and pipe manufacturing processes and products [196-202] (9:20-11:50)	(D) State-of-the-art welding technologies for pipe and tube production [D38-44] (13:00-17:00)	(D) Hot stamping and related hot forming processes for the high strength steels [D45-51] (9:15-14:30)	
Room 10 General Educ. North Annex Bldg. 4F Room No.42	— — —	— — —	Control technology for free cutting-6-1·2 [203-209] (9:00-11:30)	Analysis·simulation-1·2 [210-217] (14:00-16:50)	Powder metallurgy [218-221] (10:30-11:50)	— — —
Room 11 Green Hall	Common bases for hydrogen embrittlement studies (9:00-17:00) [2,000yen]		Heterogeneous structure control: Towards innovative development of metallic structural materials (9:30-17:00) [Charge-free]		Recent developments of analysis techniques and future strategy for predicting microstructures and mechanical properties (9:00-16:00) [1,000yen]	
Room 12 (JIM-W) Law and Lett. Bldg. 1F Room No.101	Precipitation /Precipitation·recrystallization ·grain growth [222-230] (9:00-12:10)	Solute elements and microstructure /Diffusion transformation and microstructure control [231-238] (13:30-16:20)	Ductility and toughness of high strength steels-1·2 [292-298] (9:20-11:50)	Structural steel-1·2 [299-308] (13:00-16:30)	ISIJ and JIM joint session Ultrafine grained materials— fundamental aspects for ultrafine grained structures [J25-J32] (9:00-12:00)	— — —
Room 13 Law and Lett. Bldg. 1F Room No.102	— — —	— — —	Working process and heat treatment /Pearlite and cementite [309-317] (9:00-12:10)	(D) Effect of bacteria on the materials surface [D52-58] (13:00-17:00)	Hot-clip coating /Corrosion and electrochemistry [374-380] (9:00-11:30)	— — —
Room 14 Law and Lett. Bldg. 2F Room No.201	Deformation behavior -1·2 [239-246] (9:00-11:50)	Mechanical property-1·2 [247-254] (13:00-15:50)	Stainless steel-1·2 [318-324] (9:20-11:50)	Stainless steel-3·4 [325-333] (13:30-16:40)	Diffusion and diffusionless transformation-1·2 [381-387] (9:00-11:30)	Diffusion and diffusionless transformation-3·4 [388-395] (13:00-15:50)
Room 15 Law and Lett. Bldg.2 3F Room No.305	Super alloy [255-259] (9:50-11:30)	Ferritic heat resistant steel-1·2·3 [260-270] (13:00-17:00)	Heat resisting steel· superalloy-1·2 [334-339] (9:20-11:30)	Austenitic heat resisting steels-1·2·3 [340-350] (13:00-17:00)	Stainless steel-5·6 [396-403] (9:10-12:00)	— — —
Room 16 Eng. Bldg.4 1F Room No.18	Electrical steel sheets /Surface treated steel sheets [271-275] (10:00-11:50)	Dual and TRIP steel /Strip steel [276-285] (13:30-17:00)	Hydrogen embrittlement-1 [351-354] (10:30-11:50)	Hydrogen embrittlement -2·3·4 [355-365] (13:00-17:00)	Hydrogen embrittlement -5·6 [404-409] (9:00-11:10)	— — —
Room 17 Eng. Bldg.4 2F Room No.19	Fatigue [286-291] (9:00-11:00)	Microstructure and fracture properties of structural materials (13:00-17:20) [1,000yen]	Fracture-1·2 [366-373] (9:00-11:50)	Mechanisms of alloying element effects on microstructure formation in steel (13:00-17:00) [Charge-free]	— — —	Present status and trends in mathematical modeling on corrosion reactions (13:00-15:50) [1,000yen]
Room 18 Sci. Res. Bldg.2 2F Room No.27	(D) Smart analytical methods and the monitoring techniques for steel-making processes, development of high performance steels and environmental managements [D59-67] (10:00-15:20) Process evaluation and material characterization board meeting (15:30-16:30)		Elemental analysis /Surface and state analysis [410-417] (9:00-11:50)	(D) New development of iron and steel process evaluation and material characterization technique by using biological index [D68-74] (13:00-16:05)	Crystal structure analysis -1·2 [418-425] (9:00-11:50)	— — —
Room 19 (JIM-G) General Educ. Bldg. 3F Room No.33	— — —	— — —	— — —	ISIJ and JIM joint session Titanium and titanium alloys-1·2 [J1-J7] (14:40-17:10)	ISIJ and JIM joint session Titanium and titanium alloys-3·4·5·6·7 [J8-J24] (9:00-12:10)	
Banquet (18:30-20:30 Ehime Pref. Convention Hall (HIMEGIN Hall)) [10,000yen]			Poster Session for Students (12:00-15:00 Media Hall) ISIJ Beer party (17:30-19:00 University Cafeteria)			

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

Board Meeting: Process evaluation and material characterization  
Sept.17(Mon) 15:30-16:30 Room18

### High Temperature Processes

Lecture No.	Title	Speaker	Page
<b>Reaction and flow control of solid-gas-liquid phases for designing low carbon operation of blast furnace</b>			
D1	Control of burden layer structure for low CR operation of blast furnace	A.Murao	• • • 559
D2	Reaction analysis of burden materials packed in layers in blast furnace	H.Nogami	• • • 563
D3	Reduction disintegration behavior of sinter under high concentration H <sub>2</sub> gas	T.Murakami	• • • 567
D4	Numerical simulation of melting behavior in blast furnace by particle method	S.Ueda	• • • 571
D5	Combustion and ash particle behaviors of pulverized coal	Y.Ueki	• • • 575
D6	Blast furnace operation inhibition factor in the low coke rate and necessity of the high-temperature melt behavior elucidation	K.Sunahara	• • • 579
D7	Effect of gangue mineral on slag melting behavior in blast furnace	T.Miki	• • • 583
D8	Melting behavior of ore gangue phase in cohesive zone of blast furnace -High temperature microscope investigation of melting behavior on wustite and olivine interface-	K.Suzuki	• • • 587
D9	Wettability of graphite by molten CaO-SiO <sub>2</sub> -Al <sub>2</sub> O <sub>3</sub> -MgO slags	N.Saito	• • • 591
D10	Effect of ash in carbonaceous material on iron carburization reaction	K.Ohno	• • • 595

### Improvement of the iron ore sintering process aiming at lowering its environmental load and energy saving

D11	Development of technology for low-CO <sub>2</sub> sintering process	T.Kawaguchi	• • • 599
D12	Development of gaseous reduction model for sinter in consideration of calcium ferrite reaction process	T.Usui	• • • 603
D13	Modeling of melting and agglomeration processes in sintering beds using distinct element method	T.Umekage	• • • 607
D14	Effect of addition of metallic agglomeration agent on permeability of sintering bed	T.Murakami	• • • 611
D15	Analysis of combustion rate of various carbon materials	K.Murakami	• • • 615
D16	Effect of particle size of iron ore and coke on granulation property of quasi-particle	T.Maeda	• • • 619
D17	Effect of oxygen diffusion through layer of fine particles on combustion rate of coke in quasi-particle in the sintering process	K.Ohno	• • • 623
D18	Influence of coke breeze addition timing on sinter quality	Y.Arikata	• • • 627
D19	Influence of coke breeze positioning on the sintering behavior of pellets and raw material bed with embedded pellets	T.Higuchi	• • • 631
D20	Improvement of sintering process with high-strength large granules	S.Kawachi	• • • 635
D21	Simulation for particles segregation in sintering process by DEM	J.Kano	• • • 639

### Environmental, Energy and Social Engineering

Lecture No.	Title	Speaker	Page
<b>Establishment of smart iron-making system using active carbon recycling energy system technologies (iACRES)</b>			
D22	Study on carbon recycling methodologies for iACRES	Y.Kato	• • • 643
D23	Technical examination on high temperature gas-cooled reactor as energy source of active carbon recycling energy system for steelmaking	M.Ogawa	• • • 647
D24	Thermodynamic analysis of reduction reaction of CO <sub>2</sub> to CO by decarburization reaction	H.Matsuura	• • • 651
D25	Recovery of CO <sub>2</sub> gas using cementite	Y.Fujita	• • • 655
D26	CO <sub>2</sub> decomposition by molten Li <sub>2</sub> CO <sub>3</sub> and ZrO <sub>2</sub> solid electrolyte	T.Uchiyama	• • • 659
D27	CO <sub>2</sub> electrolysis using zirconia electrolyte and effect of iron catalyst	Y.Kashiwaya	• • • 663
D28	Electrochemical reduction of CO <sub>2</sub> under ambient conditions	I.Yamanaka	• • • 665
D29	Feasibility of ironmaking by chemical vapor infiltration using waste heat and low grade iron ore	T.Nomura	• • • 666
D30	Investigation for the system of high-temperature steam generation utilizing low-temperature waste heat in iron and steel making processes	K.Nakaso	• • • 670

### Instrumentation, Control and System Engineering

Lecture No.	Title	Speaker	Page
<b>Advanced process control techniques to achieve energy-conservation and low-carbon as well as high-quality stable production</b>			
D31	Stability analysis of large scale interconnected positive systems	Y.Ebihara	• • • 673

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D32 On convergence rate of distributed control systems	K.Fujimoto	• • •	677
D33 Approximation of large-scaled dynamical systems via multi-layered hierarchical multiple time scales models	K.Tsumura	• • •	681

## Advanced system integration for facilitating "systems of operators' skills" in steel works

D34 Machine learning technologies towards "systems for advancing operator skills"	T.Terano	• • •	685
D35 Design of an agent model considering skill learning process -A case of designing a driving agent for target speed tracking-	H.Tamaki	• • •	687
D36 Study on decision support for production execution management	I.Hatono	• • •	691
D37 Sense-making support system for fostering awareness of safety	T.Sawaragi	• • •	695

## Processing for Quality Products

Lecture No.	Title	Speaker	Page
<b>Discussion Sessions</b>			
<b>State-of-the-art welding technologies for pipe and tube production</b>			
D38 (Invited Lecture)	Laser welding	S.Katayama	• • • 699
D39 (Invited Lecture)	Development of high formability laser-welded stainless steel pipes	T.Nakako	• • • 703
D40	Seam welding of high strength UOE linepipe	H.Morimoto	• • • 707
D41	Development of a new optical monitoring system of welding conditions	N.Hasegawa	• • • 711
D42	Development of laminar plasma shielded ERW process	H.Hamatani	• • • 715
D43	Finite element analysis of the electric resistance welding phenomenon	T.Okabe	• • • 719
D44 (Invited Lecture)	Development of LNG piping using invar alloy	M.Ikebe	• • • 722

## Hot stamping and related hot forming processes for the high strength steels

D45	Development of controlled forging process applying strengthening and functionally grading by interphase precipitation of vanadium carbide	T.Choda	• • • 726
D46	Large deformation working technology by high-speed large-reduction forging	M.Miyake	• • • 729
D47	Properties of steel sheet for hot stamping and press formability in hot stamping process	K.Kusumi	• • • 731
D48	High-precision valuation method for characteristics of hot stamping process	K.Ikeuchi	• • • 735
D49	Effect of heat condition and hot-forming on corrosion resistance of hot stamped aluminized steels	J.Maki	• • • 737
D50	Effect of deformation property in supercooled austenite and hot friction property of GA coated boron steel on hot stamping formability	M.Nakata	• • • 741
D51	FEM simulation of hot stamping process	N.Nomura	• • • 745

## Microstructure and Properties of Materials

Lecture No.	Title	Speaker	Page
<b>Discussion Sessions</b>			
<b>Effect of bacteria on the materials surface</b>			
D52	Adhesion behavior of microorganisms on cold-rolled steel	D.Kuroda	• • • 749
D53 (ISIJ Research Promotion Grant)	Biofilm formation of a closed loop system and its visualization	H.Kanematsu	• • • 753
D54	Biofilm formation on stainless steel surface and microbially influenced corrosion	T.Araki	• • • 755
D55	Fundamental investigation on the formation of biofilm by means of in-situ AFM	N.Hirai	• • • 759
D56	Mechanism of crude oil souring in underground	Y.Tanji	• • • 761
D57	Calorimetric measurements of antibacterial activity of copper and survival ratio of bacterial cells remaining on material surface during cleaning	K.Takahashi	• • • 763
D58	Antibacterial activity of copper alloyed stainless steel surface cleaned by using NaOCl	T.Hayashi	• • • 767

## Process Evaluation and Material Characterization

Lecture No.	Title	Speaker	Page
<b>Discussion Sessions</b>			
<b>Smart analytical methods and the monitoring techniques for steel-making processes, development of high performance steels and environmental managements</b>			
D59 (Invited Lecture)	The present state and trend of the development of skill-free chemical methods of analysis for iron and steels utilizing flow based system	T.Yamane	• • • 771
D60	Flow injection analysis of a micro amount of boron in iron and steel samples by a concentration using chelest fiber	Y.Yoichi	• • • 775
D61	Flow injection spectrophotometric determination of aluminum using chrome azurol S	S.Kato	• • • 777
D62	Analysis of rare earth elements in oxides using cathodoluminescence spectrometer	S.Imashuku	• • • 779

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D63 Analysis of the chemical state of Cr in Cr compounds using a high-resolution two-crystal X-ray fluorescence spectrometer	Y.Itô	• • •	781
D64 (Invited Lecture) Sensitive analysis of iron and steel by stripping voltammetry	T.Tanaka	• • •	782
D65 Improvement of accuracy in standard analytical methods of nickel in steel	N.Uehara	• • •	786
D66 Optimization of digestion methods and quantitative procedures of the determination of chromium content in iron and steel	K.Hosokawa	• • •	788
D67 Analysis and acquisition of experimental images for the engineering coaching in steel industry (Encouraging participants initiative by the visualization and coaching)	T.Taniai	• • •	791

## **New development of iron and steel process evaluation and material characterization technique by using biological index**

D68 Influence of additive weight of slag on elution behavior of oxidizing slag discharged from EAF normal steelmaking process	S.Yokoyama	• • •	795
D69 Effect of slag composition on the leaching behavior of lead from melt-solidified slag	H.Sano	• • •	797
D70 The role of an immunocompetent cell and the establishment of a biocompatibility assessment system which participate in the contact dermatitis induced with nickel-titan or a cobalt-chromium alloy	H.Tamauchi	• • •	799
D71 The zinc quantitative analysis of some steels eluate by animal cells	A.Ogawa	• • •	803
D72 Bioassay of zinc ion by medaka embryos	M.Yamaguchi	• • •	806
D73 Collection of metal in water by biofilm -Acquisition of metal ions in water by EPS-	N.Hirai	• • •	808
D74 Condensation behavior of silicon into biofilm formed by germs in ambient atmosphere in a laboratory and its observation	H.Kanematsu	• • •	810

# International Organized Sessions

## Technology Change in History

2012/09/17 Lecture Room 4

### Ancient and pre-modern production of iron and non-ferrous metals in Europe, Middle-East and Asia

- 09:00 ~ 09:05  
Opening remarks Prof.E.Izawa(Kyushu Univ.)
- 09:05 ~ 10:15 Chairperson:Dr.Alessandra Giunlia-Mair and Prof.T.Nakanishi
- 09:05 ~ 09:35  
Int. 1 Ancient copper production in the Gobi desert,Mongolia ... 812  
Ehime Univ. ○T.Sasada, The Mongolian Academy of Sciences A.Chunag
- 09:35 ~ 10:15  
Int. 2 (Invited Lecture)Swamimalai bronze image casting:Chola traditions and changing parameters ... 816  
National Inst. of Advanced Studies ○S.Srinivasan
- 10:30 ~ 12:10 Chairperson:Prof.S.Srinivasan and Dr.M.Tanaka
- 10:30 ~ 11:00  
Int. 3 Earthenware remains used for salt cementation of parting gold and silver at Sado in early seventeenth century Japan ... 820  
Kyushu Univ. ○E.Izawa·T.Nakanishi
- 11:00 ~ 11:40  
Int. 4 (Invited Lecture)Early instances of irogane-alloys in the west:An update ... 824  
AGM Archeoanalisi ○Alessandra Giunlia-Mair
- 11:40 ~ 12:10  
Int. 5 The use of *bajirome*(ferrous speiss produced from lead smelting)for casting imitated Chinese coins at the Kurosaki mint in the early seventeenth century ... 828  
KTR ○M.Suzuki
- 13:10 ~ 15:00 Chairperson:Prof.R.Tae-cheon and Prof.T.Sasada
- 13:10 ~ 13:50  
Int. 6 (Invited Lecture)Thermomechanical processing of highly alloyed ultra high-carbon steels and high tin bronzes in ancient Indian traditions ... 832  
National Inst. of Advanced Studies ○S.Ranganathan
- 13:50 ~ 14:20  
Int. 7 Various aspects of iron use in the Edo era, discovered from the excavations of the remains of city of Edo ... 836  
Tokyo Univ. of the Arts ○K.Mizumoto
- 14:20 ~ 15:00  
Int. 8 (Invited Lecture)Han dynasty bloomery iron smelting at Pozui site in Guangxi province,China ... 840  
Guangxi Radio and TV Univ. ○H.Quansheng, Univ. of Science and Tech. Beijing L.Yanxiang, Pingnan County Museum of Guangxi G.Hai
- 15:15 ~ 16:55 Chairperson:Dr.H.Quansheng and Dr.E.Yamasue
- 15:15 ~ 15:55  
Int. 9 (Invited Lecture)An experimental archeological study of the sand-iron sword in the Korean peninsula ... 844  
Chungnam National Univ. ○R.Tae-cheon , Kongju National Univ. C.Nam-chul·C.Hyun-kyung
- 15:55 ~ 16:25  
Int. 10 Composition and microstructure of nonmetallic inclusions in Japanese matchlock guns fabricated in the Edo period ... 848  
Tokyo Univ. of the Arts ○M.Tanaka·M.Kitada
- 16:25 ~ 16:55  
Int. 11 Building nails in the middle ages at the cloister of the Kasuga shrine in Nara ... 852  
Tokyo Univ. of the Arts ○S.Hiratsuka·K.Nagata, Tokyo Inst. of Tech. T.Watanabe
- 16:55 ~ 17:00  
Concluding remarks Prof.K.Nagata(Tokyo Univ. of the Arts)

## High Temperature Processes

Lecture No. Plenary Session	Title	Speaker	Page
1	Inducement mechanism of compressive strength of iron ore granule after drying	M.Matsuo	• • • 855
2	Measurement of surface water of sinter mixture by centrifugal dehydrator	M.Hara	• • • 856
3	In-situ observation of production process of calcium ferrite from molten Fe-Ca-O by using rapid X-ray diffraction system	R.Murao	• • • 857
4	Influence of iron ore property of micro-particle binder on sinter productivity Development of technique for sintering with large amount of ultra fine ore-1	C.Kamijo	• • • 858
5	Micro-particle addition at Wakayama No.5 sinter plant Development of technique for sintering with large amount of ultra fine ore-2	Y.Yamaguchi	• • • 859
6	Effect of addition of biomass char and metallic iron as agglomeration agents in sintering bed on permeability	K.Fujino	• • • 860
7	Increasing the reduction reactivity of low-grade iron-ore by carbon deposition using biotar	R.B.Cahyono	• • • 861
8	Reaction behavior of iron oxide-biomass char composite under high pressure	Q.Zhou	• • • 862
9	Influence of initial melt formation on reduction behavior of artificial iron ore agglomerates of FeO-CaO-SiO <sub>2</sub> -Al <sub>2</sub> O <sub>3</sub> -MgO systems under rising temperature	K.Matsuda	• • • 863
10	(ISIJ Research Promotion Grant)Molecular dynamics study of solid-liquid interfacial energy and kinetic coefficient of iron	Y.Shibuta	• • • 864
11	Large scale 3D phase-field simulations of competitive dendritic growth during directional solidification	T.Takaki	• • • 865
12	(ISIJ Research Promotion Grant)Influence of shear rate on shear deformation in semi-solid carbon steel	T.Nagira	• • • 866
13	Effect of oxide particles on TiN crystallization and solidification structure in Ti-added ferritic stainless steel	S.K.Kim	• • • 867
14	(ISIJ Research Promotion Grant)Comparison of the two peritectic reactions in the Ag-Sn alloys	Y.Hattori	• • • 868
15	Analysis of blocking process in 3-D grain selection	T.Arao	• • • 869
16	Condition for formation of coarse columnar $\gamma$ grain structure in 0.2 mass% carbon steel	M.Maruyama	• • • 870
17	Phase field simulation of effects of spatial distribution of second phase particles on kinetics of $\delta \rightarrow \gamma$ transformation interface in carbon steel	D.Sato	• • • 871
18	Quantitative phase-field model for non-isothermal solidification in multi-component alloys	M.Ohno	• • • 872
19	Activity measurement of 1 solid phase and 1 liquid phase equilibrated composition area in CaO-SiO <sub>2</sub> -CaF <sub>2</sub> system	N.Sasa	• • • 873
20	Thermodynamics property of BO <sub>1.5</sub> and SiO <sub>2</sub> in the CaO-SiO <sub>2</sub> -BO <sub>1.5</sub> melts	M.Sakamoto	• • • 874
21	Behavior of nitrogen dissolution in Fe-Cr-Ni-Mo system stainless steels	Y.Kobayashi	• • • 875
22	Solubilities of chlorine in CaO-Al <sub>2</sub> O <sub>3</sub> heterogeneous slags	K.Kuribayashi	• • • 876
23	Phase equilibria and thermodynamics of the CaO-Al <sub>2</sub> O <sub>3</sub> -CaS and the CaO-SiO <sub>2</sub> -CaS oxysulfide systems	Y.B.Kang	• • • 877
24	Thermodynamic properties of the FeS-MnS-CuS <sub>0.5</sub> ternary system at 1473 K	Y.Lei	• • • 878
25	Evaluation of activity coefficients of MnS and FeS between liquid Fe-Mn-Ca oxysulfide system and (CaO)-SiO <sub>2</sub> -MgO-FeO-MnO-P <sub>2</sub> O <sub>5</sub> slags	S.J.Kim	• • • 879
26	Microscopic observation of FeO-TiO <sub>2</sub> -SiO <sub>2</sub> -5%Al <sub>2</sub> O <sub>3</sub> slag Phase diagram for the smelting slag of TiO <sub>2</sub> containing iron sand-1	H.Itaya	• • • 880
27	Crystal phases of FeO-TiO <sub>2</sub> -SiO <sub>2</sub> -5%Al <sub>2</sub> O <sub>3</sub> slag Phase diagram for the smelting slag of TiO <sub>2</sub> containing iron sand-2	H.Itaya	• • • 881
28	DTA measurement of FeO-TiO <sub>2</sub> -SiO <sub>2</sub> -5%Al <sub>2</sub> O <sub>3</sub> slag Phase diagram for the smelting slag of TiO <sub>2</sub> containing iron sand-3	H.Itaya	• • • 882
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