

Program of the 181st ISIJ Meeting (March 17-19, 2021)

* : Republished from CAMP-ISIJ Vol.33 (2020) No.1 (Abstract of the 179th ISIJ Spring Meeting)

Discussion Sessions

Processing for Quality Products

Lecture No.	Discussion Session	Title	Speaker	Page
	Advances in research on modeling of ROT cooling in hot strip mill			
	13:10-13:35			
	D1	Trends in rapid cooling technology in the hot-rolling process	Y. Serizawa	• • • 1
	13:35-14:00			
	D2	Boiling heat transfer characteristics of upward water jet impingement onto a moving hot steel sheet	H. Fujimoto	• • • 3
	14:00-14:25			
	D3	Characteristics of transient cooling heat transfer on a rotating cylinder during a top or bottom laminar jet quenching	Y. Mitsutake	• • • 5
	14:45-15:10			
	D4	Quenching phenomenon of horizontal liquid film flow on thick steel sheet	H. Ohtake	• • • 8
	15:10-15:35			
	D5	Quenching point temperature in spray cooling of a hot surface	M. Kohno	• • • 9
	15:35-16:00			
	D6	Effects of surface oxide film on spray cooling heat transfer characteristics	N. Nagai	• • • 13
	16:00-16:25			
	D7	Enhancement of natural-convection boiling heat transfer using a porous coating layer	H. Ohkubo	• • • 15

Processing for Quality Products

Needs for tubes with uneven thickness and their manufacturing and forming techniques

	13:10-13:30			
	D8	Condition of contraction occurrence in flange forming of steel tube edge	Y. Yoshida	• • • 16
	13:30-13:50			
	D9	Measurement of thickening behavior of metal tube subjected to combined compression-torsion stresses	K. Minemura	• • • 18
	13:50-14:10			
	D10	Possibility of locally heat-assisted dieless drawing process for manufacturing variable thickness steel tubes	T. Furushima	• • • 20
	14:20-14:40			
	D11	Manufacturing uneven thickness tube by stretch reducing	H. Yoshimura	• • • 22
	14:40-15:00			
	D12	Hydroforming simulation for providing tubes with thickness distribution in axial direction	A. Shirayori	• • • 25
	15:00-15:20			
	D13	Deformation property of eccentric pipe in press bending process	K. Nakajima	• • • 27

Microstructure and Properties of Materials

Understanding plasticity-induced damage evolution: overcoming mechanical problems

	9:30-10:00			
	D14	(ISIJ Research Promotion Grant) Factors affecting hydrogen embrittlement susceptibility in low stacking fault energy steels	M. Koyama	• • • 29
	10:00-10:30			
	D15	(ISIJ Research Promotion Grant) Influence of Mn addition on fatigue limit and coxing effect in ferritic steel containing solute carbon	K. Tsuzaki	• • • 30
	10:45-11:15			
	D16	Unique work hardening and fracture behaviors induced by planar dislocation structure in high nitrogen austenitic stainless steels	T. Tsuchiyama	• • • 34
	11:15-11:45			
	D17	A new aspect of hydrogen as an alloying element enables greater strength and ductility in steels: an example of Fe-Cr-Ni-based alloy	Y. Ogawa	• • • 37
	13:30-14:00			
	D18	Effect of the punching process on strength properties of metals	S. Hamada	• • • 41

Program of the 181st ISIJ Meeting (March 17-19, 2021)

14:00-14:30

D19	Microstructural control of high-strength low alloy TRIP-aided steel sheets to enhance their strength and press formabilities	T. Hojo	• • •	42
-----	--	---------	-------	----

14:45-15:15

D20	Analysis of strain path effect on ductile failure limit for two-phase steel	M. Ohata	• • •	44
-----	---	----------	-------	----

15:15-15:45

D21	Prediction of structure-property relationship and inverse analysis of DP steels by crystal plasticity finite element analysis	T. Shiraiwa	• • •	46
-----	---	-------------	-------	----

15:45-16:15

D22	Low temperature embrittlement and hydrogen embrittlement of martensitic steels	A. Shibata	• • •	50
-----	--	------------	-------	----

Program of the 181st ISIJ Meeting (March 17-19, 2021)

International Organized Sessions

Committee for Social Relations with Iron and Steel Sector 2021/3/18 Room 1

Current developments in nondestructive analysis using synchrotron radiation, neutron, and muon -Towards application of cultural heritage research-

12:30-12:35

Opening Address: T. Nakanishi [Kyushu Univ.]

Chair: A. Sato [Osaka Univ.]

12:35-13:05

Int.-1 (Invited Lecture) Current developments of neutron scattering measurements for steel research

National Institute of Advanced Industrial Science and Technology ○Y. Tomota

• • •

58*

13:05-13:25

Int.-2 Archaeometallurgy of Japanese sword using neutron diffraction

JAEA ○S. Harjo • K. Oikawa • T. Kawasaki, IFAC-CNR F. Grazzi, JAEA T. Shinohara,
Showa Women's Univ. M. Tanaka

• • •

60*

13:25-13:45

Int.-3 Development of high-energy X-ray microtomography at spring-8: current status and application to
metallic cultural heritage

Japan Synchrotron Radiation Research Institute ○M. Hoshino • K. Uesugi • N. Yagi

• • •

67*

13:45-14:05

Int.-4 Nondestructive study of Japanese swords using synchrotron x-ray computed tomography to
elucidate sword-making techniques

Showa Women's Univ. ○M. Tanaka, Gifu Prefectural Industrial Technology Center Y. Mizutani,
Japan Synchrotron Radiation Research Institute M. Hoshino • K. Uesugi

• • •

70*

Chair: Y. Matsui [Kobelco Research Institute]

14:15-14:45

Int.-5 (Invited Lecture) Integration of arts and sciences by using negative muon nondestructive analysis
at J-PARC MUSE

High Energy Accelerator Research Organization ○Y. Miyake • M. Tampo • S. Takeshita •
K. Shimomura • P. Strasser • S. Doiuti

• • •

72*

14:45-15:05

Int.-6 Non-destructive elemental analysis of archaeological metal materials using muonic X-rays

Okayama Univ. ○K. Minami, Osaka Univ. A. Sato • K. Ninomiya,
International Christian Univ. K. Kubo, Osaka Univ. D. Tomono • Y. Kawashima

• • •

73*

15:05-15:25

Int.-7 Non-destructive identification of carbon content in iron product by muon lifetime measurement

Osaka Univ. ○K. Ninomiya

• • •

74*

15:25-15:45

Int.-8 Development of an in-museum non-destructive elemental analysis with cosmic-ray muons for cultural heritage

Osaka Univ. ○A. Sato

• • •

76*

Chair: J. Kawai [Kyoto Univ.]

15:55-16:25

Int.-9 (Invited Lecture) Comprehensive, neutron-based characterization of cultural heritage objects at
the Budapest Neutron Centre, Hungary

Budapest Neutron Centre ○L. Szentmiklosi • Z. Kis • B. Maroti • Z. Kasztovszky • I. Harsanyi • K. Bajnok

• • •

61*

16:25-16:55

Int.-10 (Invited Lecture) Combining MA-XRF and OCT in the investigation of the dark background of
Vermeer's Girl with a Pearl Earring

Delft Univ. of Technology ○J. Dick • G. Harteveld • T. Callewaert • J. Kalkman,
Mauritshuis A. van Loon, Rijksmuseum A. Vandivere

• • •

71*

16:55-17:25

Int.-11 (Invited Lecture) The use of neutrons in the study of historical copper alloys and sculpture at the rijksmuseum

Rijksmuseum ○R. van Langh

• • •

64*

17:25-17:30

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

Program of the 181st ISIJ Meeting (March 17-19, 2021)

High Temperature Processes

Lecture No.	Title	Speaker	Page
Plenary Session			
Slag and dust treatment			
1	(Nishiyama Commemorative Prize) Development of ferrous slag application for environmentally responsible utilization	K. Takahashi	53
2	(ISIJ Research Promotion Grant) Influence of water immersion and heat treatment on the strength of recycled compacted concrete	M. Mostazid	54
3	Composition of steelmaking slag to prevent alkaline dissolution	Z. Zhu	55
4	P distribution in phosphorus containing slag at elevated temperature	Y. Uchida	56
Young engineer session of coke-making and coal			
5	Influence of low-temperature oxidation on structure of coal	M. Uchida	57
6	Effective utilization method of surface tension based coal blending technique -The effect of coal fluidity-	D. Igawa	58
7	Wet quenching of coke moisture reduction measures in Kimitsu 4, 5 furnace	K. Handa	59
8	Prediction of coke strength with artificial intelligence	K. Sakai	60
Electromagnetic processing of materials			
9	Liquid phase motion in the solid-liquid mixed region excited by superimposition of magnetic field and current	Y. Nishi	61
10	Some specific phenomena observed in microwave carbothermic reduction of NiO	N. Yoshikawa	62
11	(ISIJ Research Promotion Grant) Effect of microwave frequency on carbothermal reduction reaction in an electromagnetic-wave ironmaking	J. Fukushima	63
Solidification and structure control			
12	(Sawamura Award) Selection of the massive-like δ - γ transformation due to nucleation of metastable δ phase in Fe - 18 mass%Cr - Ni alloys with Ni contents of 8, 11, 14 and 20 mass%	H. Yasuda	64
13	Measurement of the linear expansion coefficient of Fe-18Cr-Ni alloy during cooling from melt by using 4D-CT	T. Narumi	65
14	Crystallographic orientation relationship between gamma grains produced by a massive-like transformation in Fe-0.18C-0.6Mn-0.3Si alloy	S. Tsuji	66
15	Sequential measurement of change in the volume and temperature of Fe-0.05C steel during solidification	Y. Nanri	67
16	Solidification behavior of austenitic stainless steels for additive manufacturing	Y. Miyata	68
Continuous casting and solidification phenomena			
17	(Nishiyama Commemorative Prize) Mold lubrication and control of initial solidification in continuous casting of steel	T. Kajitani	69
18	Development of prediction method of hypo-peritectic steel	Y. Sakurai	70
19	Establishment of a method for evaluating the corrosion resistance of powder line part of immersion nozzle	K. Nakamura	71
Young engineer session of ironmaking			
20	Pore structure of sinter cake with granulation with inclined mixing of lime (Development of granulation with inclined mixing of lime - 3)	S. Yamazaki	72
21	Experimental investigation of shear pulverization behavior of coke particles	A. Hisatsune	73
22	Prediction of mass flow rate of nut coke during discharging from hopper of blast furnace	H. Mio	74
Reduction and softening and melting 1			
23	(ISIJ Young Researcher Award) Estimation of shrinking behavior of ore raw materials during softening process	N. Yasuda	
24	Mechanism of iron nugget formation during reduction of iron oxide-carbon composite	R. Higashi	75
25	The reduction of hematite(Fe ₂ O ₃) with boron-nitride(BN)	N. Ishikawa	76
Reduction and softening and melting 2			
26	3-Dimensional analysis of reduction behavior of iron ore particle with complex shape	J. Kim	77
27	Evaluation of reduction rate of fine iron ore for H ₂ reduction ironmaking	T. Gotoh	78
28	Reduction behavior of iron ore during gasification of pulverized coal	K. Yamamoto	79

Program of the 181st ISIJ Meeting (March 17-19, 2021)

Analysis of processes in blast furnace

29 (ISIJ Young Researcher Award) Studies on transport phenomena analysis of ironmaking process	K. Terui		
30 (ISIJ Research Promotion Grant) Dynamics and geometric data analysis of coke packed bed structure including fines	S. Natsui	• • •	80
31 Quantification of particle-fluid motion by cold model of blast furnace raceway	S. Ueda	• • •	81

Quantification of solidification phenomena using in-situ observation, modeling and simulation techniques III-1

32 3D analysis of solidified structure in Al-Cu ingot by Sato mold with the use of high energy X-ray tomography	T. Yoshimura	• • •	82
33 Analysis of macro-segregation and cast defect developed by dendrite bridging	H. Miyahara	• • •	83
34 (ISIJ Research Promotion Grant) Three-dimensional simulations of macrosegregation using flow calculation by lattice Boltzmann method	Y. Natsume	• • •	84
35 Permeability prediction of liquid flow in equiaxed dendritic structures by phase-field and lattice Boltzmann methods	T. Takaki	• • •	85
36 Effect of gradient magnetic field on liquid metal velocity flowing in insulating packed bed	G. Kusunoki	• • •	86

Quantification of solidification phenomena using in-situ observation, modeling and simulation techniques III-2

37 Solid-liquid interfacial energy for pure Fe at nonequilibrium temperature by metadynamics	K. Ueno	• • •	87
38 Estimation of solid-liquid interface properties in pure Fe by combining molecular dynamics and phase-field simulations using data assimilation	M. Ohno	• • •	88
39 Quantitative evaluation of solute concentration around solidification interface by interferometry	S. Kawanishi	• • •	89
40 Numerical prediction of diffusion profile near the interface between solid Pt-group metals and molten Ni-based alloys	M. Ode	• • •	90

Secondary refining and inclusion 1

41 Effect of wettability on penetration and flotation behavior of a particle	A. Matsuzawa	• • •	91
42 Analysis of soluble O content in ultra low C Al-killed steel using inert gas fusion infrared absorption analyzer	Y. Kang	• • •	92
43 Interfacial reaction between ultra low C liquid steel and Al ₂ TiO ₅	Y. Park	• • •	93
44 (ISIJ Research Promotion Grant) Ultrasonic measurement for estimating flow fields using particles with two different sizes	Y. Tasaka	• • •	94

Secondary refining and inclusion 2

45 (Tawara Award) Relation between mass transfer coefficient and stirring power during gas bubbling in molten steel	A. Okayama	• • •	95
46 Inclusion evolution on surface of liquid ultra low carbon steel: CSLM investigation and composition analysis	Y. Cho	• • •	96
47 Investigation on inclusion agglomeration on liquid ultra low C steel surface: Role of Ti and oxygen potential	D. Kim	• • •	97

Hot metal treatment and converter

48 (Nishiyama Commemorative Prize) Research and development of environment-friendly steelmaking process	M. Miyata	• • •	98
49 Effect of converter shape on reaction rate between slag and metal in a top and bottom-blowing converter	H. Yoshida	• • •	99
50 Formation mechanism of the interface between CaO-SiO ₂ -FeO _x -15~20%P ₂ O ₅ molten slag and solid CaO at 1573 K	T. Kimura	• • •	100
51 Fundamental study on tilting deslagging behavior using laboratory scale BOF	M. Tsuboi	• • •	101

Thermodynamics and properties of liquid materials

52 (Scientific Achievement Merit Prize • ISIJ Research Promotion Grant) Approach to steelmaking processes from the perspective of thermophysical properties	M. Susa		
53 (ISIJ Research Promotion Grant) Sulfide capacity of CaO-SiO ₂ -Fe _x O molten slag	A. Fujisawa	• • •	102
54 Effect of coordination structure of iron ions on activity coefficients of iron oxide in the CaO-SiO ₂ -FeO-Fe ₂ O ₃ melts	S. Takatsuji	• • •	103
55 (Tawara Award) Estimation of activity coefficient of solute in infinite dilute liquid iron based on surface tension of binary liquid Fe alloys	M. Nakamoto	• • •	104
56 (Distinguished Article Award) Removal of boron from molten silicon using CaO-SiO ₂ based slags	K. Morita	• • •	105

Program of the 181st ISIJ Meeting (March 17-19, 2021)

Iron ore and sinter

57	Analysis of phosphate minerals in iron ore by Raman/IR-spectroscopic method	S. Kawanami	• • •	106
58	Effect of limestone size on the strength of sintered pellets prepared for the composite sintering process	Z. Ma	• • •	107
59	Development of microstructure evaluation for multi-component calcium ferrite by EPMA phase analysis	M. Mizutani	• • •	108
60	Characterization of multi component calcium-ferrites in iron ore sinter by EBSD method	R. Murao	• • •	109

Sintering process

61	Numerical simulation of sintering process using combustion rate of charcoal	Y. Tanaka	• • •	110
62	Improvement of thermal efficiency at upper sintering layer by re-ignition method Development of REMO-tec (RE-ignition method for optimization of total energy consumption) - 1	M. Matsumura	• • •	111
63	Effect of yield improvement by use of REMO-tec in Muroran No.6 sintering machine Development of REMO-tec (RE-ignition method for optimization of total energy consumption) - 2	R. Kosugi	• • •	112
64	Structure change of sinter cake by REMO-tec Development of REMO-tec (RE-ignition method for optimization of total energy consumption) - 3	K. Hara	• • •	113
65	Development of sintering improvement technique for large Use of dehydrated fine ore	S. Fujiwara	• • •	114

Sustainable Systems

Lecture No.	Title	Speaker		Page
Plenary Session				

CO₂ reduction and resources

66	(Sawamura Award) Water gas shift reaction and effect of gasification reaction in packed-bed under heating-up condition	Y. Kashiwaya	• • •	115
67	(ISIJ Research Promotion Grant) Polymeric hybrid membranes for carbon dioxide separation	S. Kanehashi	• • •	116
68	Synthesis of functional oxides capable of adsorbing CO ₂ from blast furnace slag and its application in CO ₂ captures	A. Hanaki	• • •	117
69	(ISIJ Research Promotion Grant) Evaluation of the effect of humic acids on the reductive elution of Fe from Fe-oxide	H. Iwai	• • •	118
70	Heat transfer promotion evaluation of boundary film stripping type heat exchanger based on heat flow analysis	T. Seo	• • •	119

Advanced heat utilization technology for the steelmaking industry

71	Temporal change of carbon steel surface in scaling environment	S. Koyama	• • •	120
72	(ISIJ Research Promotion Grant) Heat recovery by rotating cylindrical heat exchanger with precipitation control under impure condition	N. Maruoka	• • •	121
73	(ISIJ Research Promotion Grant) Enhancement of rate of regeneration of urea in the urea/water chemical air-conditioning system	K. Nakaso	• • •	122
74	Effect of aluminizing condition on formation of compound layer on the surface of iron-based heat storage alloy	D. Maruoka	• • •	123

Utilization of unused energy, green energy, or unused materials for sustainable steel production processing and related issues 1

75	Effective utilization of low-quality waste heat by magnesium chloride/ammonia chemical heat pump	S. Yoshida	• • •	124
76	(ISIJ Research Promotion Grant) Strength and gasification reactivity of coke prepared from blending of Ca/C composite and caking coal	Y. Mochizuki	• • •	125
77	(ISIJ Research Promotion Grant) Gasification behavior of sulfur in desulfurization slag under CO ₂ stream	H. Kubo	• • •	126
78	Influence of type of organic acids on the leaching behavior of various elements from steelmaking slag into water	H. Matsuura	• • •	127

Utilization of unused energy, green energy, or unused materials for sustainable steel production processing and related issues 2

79	Full use of a steelmaking slag using lithium carbonate	M. Nakaura	• • •	128
80	Leaching of calcium from steel making slag in carbonic acid	R. Suehiro	• • •	129
81	Fundamental study on iron ore reduction process using municipal solid waste as carbon source	H. Hasegawa	• • •	130
82	(ISIJ Research Promotion Grant) Investigation of reduction gasification of phosphorus compounds	H. Konishi	• • •	131

Program of the 181st ISIJ Meeting (March 17-19, 2021)

Instrumentation, Control and System Engineering

Lecture No. Plenary Session	Title	Speaker	Page
Control and systems			
83	(Sawamura Award) Transient model-based prediction of hot metal temperature	Y. Hashimoto	• • • 132
84	(Shiraishi Commemorative Prize) Research of advanced process control technologies in a continuous caster	H. Kitada	
85	(Nishiyama Commemorative Prize) Strip walking control technology in hot strip finishing mill	Y. Washikita	• • • 133
86	Development of anomaly detection system for hot strip mills	M. Matsushita	• • • 134
Instrumentation			
87	Two-color radiation thermometry applied to environment accompanied by water and steam	K. Morioka	• • • 135
88	Development of surface inspection system with texture analyses	M. Kemmochi	• • • 136
89	Development of length measurement device for stepped round rod	T. Takishita	• • • 137

Processing for Quality Products

Lecture No. Plenary Session	Title	Speaker	Page
Manufacturing technology of high quality, high functional structure metals			
90	Simulation of the influence of Lode parameter on ductile fracture using an ellipsoidal void model	K. Komori	• • • 138
91	Defects behavior and processing limit in wiredrawing investigated by large-scale molecular dynamics simulations	K. Saitoh	• • • 139
92	Effect of heating temperature on residual stress in drawing process using temperature gradient	Y. Akimoto	• • • 140
Cooling			
93	Heat transfer characteristics for round water jet obliquely impinging on moving hot solid	K. Tatebe	• • • 141
94	Cooling characteristics of upward planar water jet to moving hot sheet	T. Hikata	• • • 142
95	Evaluation of thermal efficiency of radiant tube by using CFD model	T. Kawashima	• • • 143
Process modeling of rolling and forging			
96	(Mishima Medal) Developments of plastic working process mainly for forging	K. Tamura	
97	Investigation of influence of hot cogging conditions for void consolidation using S45C small ingot	T. Tsuji	• • • 144
98	The influence of plate crown on the shape in plate rolling	Y. Suzuki	• • • 145
Cracking			
99	Verification of simulated crack repair effect with plasma sintering and iron fine particle method based on in-situ fatigue test and fractography	D. Sasaki	• • • 146
100	Mechanism of HAZ softening suppression by addition of Mo and V in friction stir welded Si-Mn carbon steel	Z. Wu	• • • 147
101	Effect of grain orientation on hot cracks in additively manufactured Hastelloy X	K. Prasad	• • • 148
Steel sheet			
102	(Shiraishi Commemorative Prize) Research and development of processing technologies in the manufacturing process of steel sheets	M. Miyake	
103	Quantification of surface topology using wide-field analysis with scanning white-light interference microscope	Y. Okada	• • • 149
104	Measurement and analysis of elasto-plastic deformation behavior of cold rolled mild steel sheet subjected to non-linear stress path	Y. Takada	• • • 150

Program of the 181st ISIJ Meeting (March 17-19, 2021)

Microstructure and Properties of Materials

Lecture No.	Title	Speaker	Page
Plenary Session			
Machine structural steel and plate			
105	(Nishiyama Commemorative Prize) Development of medium carbon steel wires for cold heading	M. Okonogi	• • • 151
106	Investigation of P segregation behavior at austenite grain boundaries in high carbon martensitic steel	A. Goto	• • • 152
107	Effects of cooling rate after hot-forging and normalizing temperature on the fine precipitates and austenite grain structure formed at carburization of case-hardening steel	G. Saito	• • • 153
108	Effect of heating condition of quenching on α_B grain size of low C-Mn steel	Y. Honma	• • • 154
Aging and precipitation			
109	(ISIJ Research Promotion Grant) Consideration of solid solution states and ordering tendencies of B-atom pairs in FCC-Fe based on electron theory	M. Enoki	• • • 155
110	(Sawamura Award) Dependence of carbon concentration and alloying elements on the stability of iron carbides	H. Sawada	• • • 156
111	(Nishiyama Commemorative Prize) Atom probe analysis of carbon behavior in the development of various steels	N. Maruyama	• • • 157
112	Effect of Si, Al addition on the precipitation of proeutectoid cementite in hypereutectoid steel	K. Fukuchi	• • • 158
113	Improvement of strength-ductility balance of ferritic steel via bi-modal distributed cementite	L. He	• • • 159
Sheet steel			
114	(ISIJ Young Researcher Award) Establishment of microstructural analysis methods contributing the development of high strength dual-phase steel sheets	H. Minami	
115	(Satomi Prize) Designing functions and stable manufacturing of pre-coated steel sheets	H. Furukawa	
116	(Mishima Medal) Development of high Si steel sheet using continuous siliconizing technology	Y. Oda	
117	(Sawamura Award) Effect of Sn addition on evolution of primary recrystallization texture in 3% Si steel	R. Suehiro	• • • 160
Stainless steels 1			
118	(Shiraishi Commemorative Prize) Control of the microstructure in ferritic stainless steels	K. Kimura	
119	(Nishiyama Commemorative Prize) Development of stainless steel and high strength steel with enhanced performance	T. Yokota	• • • 161
120	(Nishiyama Commemorative Prize) Research and development of high-performance stainless steel bars and wire rods	K. Takano	• • • 162
Stainless steels 2			
121	(ISIJ Research Promotion Grant) Mechanical damage and natural potential of oxide film of stainless steel	O. Kuwazuru	• • • 163
122	Dissolution behavior in indirect energizing electrolytic pickling for stainless steels	T. Mizoguchi	• • • 164
123	Effect of trace amount of Nb on the corrosion resistance of weld of new SUS329J1 steel (The development of a SUS329J1 steel exhibiting good welding properties -3)	Y. Oikawa	• • • 165
124	Effect of stabilization of ferritic phase on oxidation resistance in 14%Cr ferritic stainless steel	A. Hayashi	• • • 166
Surface technology and chemical property			
125	Segregation mechanism of Al-based oxides on surface of hot-dip galvanized steel sheets	K. Hoshino	• • • 167
126	Electrochemical impedance spectroscopy for corrosion characterization of high corrosion resistant stainless steels	D. Kudo	• • • 168
127	(ISIJ Research Promotion Grant) Development of hollow-structured catalysts encapsulating alloy nanoparticles for the synthesis of H ₂ storage materials from CO ₂	Y. Kuwahara	• • • 169
Heat resistant steels and alloys 1			
128	(Nishiyama Commemorative Prize) Ideas of microstructural evaluation in high-Cr ferritic heat-resistant steels to understand the high temperature strength	M. Mitsuhashi	• • • 170
129	(ISIJ Young Researcher Award) Relationship between creep strength and magnetic properties of cobalt-bearing ferritic heat resistant steel	S. Yamasaki	
130	Microstructural evolution during thermal aging of 12Cr steel for turbine rotor material	H. Tokunaga	• • • 171

Program of the 181st ISIJ Meeting (March 17-19, 2021)

Heat resistant steels and alloys 2

131	(Nishiyama Commemorative Prize) Development of heat resistant steels and alloys for engine exhaust systems	S. Ueta	• • •	172
132	Graphitization behaviors of creep-ruptured carbon steel at 673 to 773 K	T. Hatakeyama	• • •	173
133	Effect of microstructural change on long-term creep strength of KA-SUS304J1HTB	K. Sawada	• • •	174
134	Precipitation behavior of TCP P (<i>oP56</i>) phase at grain boundaries in Ni-Cr-Mo ternary system	R. Nagashima	• • •	175

Hydrogen embrittlement 1

135	Hydrogen charging in to metal at low temperature by Potassium alkoxide reaction method	R. Ohkuma	• • •	176
136	Stability of hydrogen entry into iron in aqueous solution containing ammonium thiocyanate under cathodic polarization	S. Ajito	• • •	177
137	Effect of chloride ion concentration on hydrogen entry efficiency into steel sheet	H. Kawanami	• • •	178
138	Evaluation method of hydrogen entered steel in a corrosive environment	M. Kawamori	• • •	179

Hydrogen embrittlement 2

139	Effect of tempering conditions on hydrogen trapping of V and Mo carbide precipitates	T. Kinami	• • •	180
140	Hydrogen trapping behavior of tempered martensitic steels containing vanadium and/or molybdenum	R. Moriya	• • •	181
141	(ISIJ Research Promotion Grant) Fabrication and hydrogen desorption behavior of hydrogen-containing bulk single phase cementite	N. Adachi	• • •	182
142	Interaction between hydrogen and grain boundaries in pure iron using thermal desorption spectrometry from low temperature	R. Sato	• • •	183
143	(ISIJ Research Promotion Grant) Temporal change of the hydrogen-induced defects in pure Ni by SC-linac-based positron annihilation spectroscopy	M. Fujinami	• • •	184

Hydrogen embrittlement 3

144	(Sawamura Award) Crystallographic characterisation of hydrogen-induced twin boundary separation in type 304 stainless steel using micro-tensile testing	Y. Mine	• • •	185
145	Improving resistance for hydrogen-embrittlement by controlling carbon segregation on prior austenite grain boundary in 3Mn-0.2C martensitic steel	K. Okada	• • •	186
146	Fatigue crack propagation behavior in martensitic steel under hydrogen environment	H. Matsumiya	• • •	187
147	Evaluation of mechanical properties of low alloy steel in hydrogen environment using concurrent cathodic hydrogen charging	Y. Nishihara	• • •	188

Hydrogen embrittlement 4

148	(ISIJ Research Promotion Grant) Effect of grain size and hydrogen content on hydrogen embrittlement behavior in ultrafine-grained iron	S. Mitomi	• • •	189
149	Change in states and effect on embrittlement susceptibility by heat application of non-diffusible hydrogen in high-strength steel	K. Okuno	• • •	190
150	Hydrogen embrittlement behavior in resistance spot welded joint of ultra-high strength steel sheet	K. Yashima	• • •	191
151	Neutron diffraction texture evaluation of hydrogen charged high strength steel after uniaxial tensile deformation	P. Xu	• • •	192

Grain boundary and grain boundary segregation

152	(Distinguished Article Award) Grain boundary engineering approach to improve hydrogen embrittlement resistance of Fe-Mn-C TWIP steel	C. Lee	• • •	193
153	Grain boundary phosphorus segregation and toughness of friction stir welded high phosphorus steel	T. Kawakubo	• • •	194
154	Verification of thermodynamic models for the prediction of grain boundary segregation of carbon and nitrogen in ferritic steels	Y. Zhou	• • •	195

Diffusional phase transformation

155	Comparative study of Mo, Mn and Ni interaction with migrating α/γ interface	G. Miyamoto	• • •	196
156	(Tawara Award) Dynamic accommodation of internal stress and selection of crystallographic orientation relationship in pearlite	N. Nakada	• • •	197
157	(ISIJ Research Promotion Grant) Formation of nodular ferrite in a low carbon steel with VC interphase precipitation	Y. Zhang	• • •	198
158	Kinetics of delta-pearlite reaction formed by carburization in Fe-Cr binary alloy	W. Hao	• • •	199
159	(ISIJ Research Promotion Grant) Reaction diffusion between solid Fe and liquid Al alloys	M. O	• • •	200

Program of the 181st ISIJ Meeting (March 17-19, 2021)

Microstructure evolution 1

160	Austenite reversion behavior of maraging steel additively manufactured by laser powder bed fusion	N. Takata	• • •	201
161	Effects of C and Cr on block size of intragranular acicular ferrite in weld metals	H. Matsuo	• • •	202
162	Microstructure evolution during thermomechanical processing and mechanical properties of aluminum added medium manganese steel	T. Yamashita	• • •	203
163	Formation and mechanical properties of fine ferrite+fine dispersed austenite structure in 0.1C-2Si-5%Mn steels by rapid heating and cooling based on cementite metallurgy	S. Torizuka	• • •	204

Microstructure evolution 2

164	(Nishiyama Commemorative Prize) Development of high-formable steel sheets by crystalline texture control	K. Okuda	• • •	205
165	Effect of Sn, Sb addition on MnS and grain growth behavior in ferritic steel	N. Ueshima	• • •	206
166	Effects of lubricant on crystallographic texture formed by shot-peening for pure Fe	H. Sato	• • •	207
167	Austenite inhomogeneous recrystallization induced by martensitic reversion in super invar cast alloy	N. Nakada	• • •	208

Strength and deformation behavior 1

168	Work-hardening behavior under strain path changes in pearlite steel	K. Nakada	• • •	209
169	Effects of cementite morphology on the deformability of pearlite colonies	Y. Yajima	• • •	210
170	(Nishiyama Commemorative Prize) Deformation and fracture in wire-drawn pearlitic steels	M. Tanaka	• • •	211
171	(Nishiyama Commemorative Prize) Study on tensile deformation behavior of steels	N. Tsuchida	• • •	212

Strength and deformation behavior 2

172	Local deformation behavior of ferrite + martensite dual-phase steels with different hardness-ratio between phases	M. Park	• • •	213
173	Effect of cooling rate on austenite stabilization during quenching and partitioning process	T. Asakawa	• • •	214
174	(Tawara Award) Analysis of Tensile deformation behavior by in situ neutron diffraction experiments of a 1 GPa grade TRIP steel with high elongation	N. Tsuchida	• • •	215
175	(ISIJ Young Researcher Award) Study of high strength TRIP-aided steel	J. Kobayashi		

Strength and deformation behavior 3

176	Formation of inhomogeneous microstructure in martensitic steel during cooling and its effect on yield strength	S. Yoshioka	• • •	216
177	Tensile behavior of low alloy steel containing retained austenite monitored by neutron diffraction at low temperatures	T. Yamashita	• • •	217
178	Lattice strain and solid solution hardening in FeNiCoCrMn high entropy alloy and its sub-alloys	P. Thirathipviwat	• • •	218
179	Effect of Ni and C contents on mechanical properties and deformation behavior of Fe-Ni-Al-C alloys	Y. Mori	• • •	219
180	Effect of Al contents and cold rolling on mechanical properties and inhomogeneous deformation behavior of Fe-Ni-Al-C alloys	Y. Kawano	• • •	220

Strength and deformation behavior 4

181	Transition of type of Portevin-LeChatelier band in austenitic stainless steel	S. Lee	• • •	221
182	$\gamma \rightarrow \epsilon \rightarrow \alpha'$ type deformation induced martensite transformation in SUS304 stainless steel	Y. Onuki	• • •	222
183	Effect of Cr and Ni contents on the strength and ductility enhancement by solute hydrogen in austenitic steels	H. Nishida	• • •	223
184	Variation of microstructure of austenitic stainless steel applied cyclic plastic strain	M. Kumagai	• • •	224
185	Practical application of crack repair method by plasma particle method for large aluminum structures	M. Shiki	• • •	225

Martensite and bainite 1

186	Dependence of solute carbon on electrical resistivity of retained austenite	S. Uranaka	• • •	226
187	Effect of carbon on dislocation density calculated by line profile analysis in martensitic steel	T. Masumura	• • •	227
188	Effect of carbon on hardness and dislocation density in ausformed 5%Mn martensitic steel	R. Hidaka	• • •	228
189	Effect of Nb and Mo on the morphology of lath martensite	Y. Kawamoto	• • •	229
190	(Nishiyama Commemorative Prize) Microstructure formation process during martensitic transformation in steels	S. Nambu	• • •	230

Martensite and bainite 2

191	Deviation from the invariant plane condition inside thin-plate martensite	Y. Shinohara	• • •	231
192	EBS variant analysis on triple $\gamma/\epsilon/\alpha'$ phase microstructure developed in Fe-15Mn alloy	T. Sawaguchi	• • •	232

Program of the 181st ISIJ Meeting (March 17-19, 2021)

193	Three-dimensional observation of the microstructure of lower bainite nucleated from grain boundaries in medium carbon steel	S. Jimbo	• • •	233
194	(ISIJ Research Promotion Grant) Effect of Cr addition on the bainitic transformation and tensile properties of Fe-Mn-N alloy	M. Sato	• • •	234
Prediction and modeling of metallurgical phenomena and properties 1				
195	(Nishiyama Commemorative Prize) Design of high temperature materials by computational materials science	R. Sahara	• • •	235
196	Effect of elastic field on the carbon partitioning in Q&P process in steel	R. Soeda	• • •	236
197	Identification for SEM images of low-carbon steels based on textural analysis	K. Tsutsui	• • •	237
198	Cellular automaton simulation of ferrite transformation in carbon steel (Steel informatics 25)	Y. Adachi	• • •	238
199	Simulation of recrystallization and grain growth with cellular automation (Steel informatics 26)	Z. Wang	• • •	239
Prediction and modeling of metallurgical phenomena and properties 2				
200	Monte carlo simulation on grain growth in dual phase microstructure (Steel informatics 27)	Y. Adachi	• • •	240
201	Topology optimization of complex microstructure by FEM (Steel informatics 28)	R. Maeda	• • •	241
202	Topology optimization of virtual complex microstructure by the hybrid analysis of FEM, persistent homology and inverse analysis (Steel informatics 29)	R. Maeda	• • •	242
203	Development of high-precision recognition technology for brittle fracture initiation point by end-to-end generation image recognition YOLO (Steel informatics 30)	M. Muramatsu	• • •	243
Strength and deformation behavior 5				
204	Evaluation of dislocation density of martensitic steels by X-ray diffraction method [1] Effect of solute carbon on the Full-width at half-maximum (FWHM) in diffraction peaks	M. Iwamura	• • •	244
205	Evaluation of dislocation density of martensitic steels by X-ray diffraction method [2] Effect of peak separation on the apparent dislocation density	S. Takaki	• • •	245
206	(ISIJ Research Promotion Grant) Oxide particle-dislocation interaction of FeCrAl(Zr)-based oxide dispersion strengthened (ODS) alloy	N. Oono-Hori	• • •	246
207	(ISIJ Research Promotion Grant) In-situ TEM observation of the interaction between screw dislocations and hydrogen-ion produced prismatic dislocation loops in iron	T. Inoue	• • •	247
Toughness and ductility				
208	(Mishima Medal) Toughening ultrafine-grained steel by fracture control technology	T. Inoue		
209	Conditions of separation fracture in medium Mn multi-phased martensitic steel	T. Maeda	• • •	248
210	Evaluation of the cracking probability of TiN particles in a steel	Y. Nonaka	• • •	249
211	Evaluation method for ductile crack initiation and growth conditions	A. Hatamoto	• • •	250
Process Evaluation and Material Characterization				
Lecture No.				
Plenary Session	Title	Speaker		Page
Crystal structure analysis				
212	(Asada Medal) Three-dimensional reconstruction of crystal defects using electron microscopy	S. Hata		
213	(ISIJ Research Promotion Grant) Improvement of an evaluation method for ferrite/austenite phase volume fraction using neutron Bragg-edge imaging	H. Sato	• • •	251
214	Characterization of thin oxides layers formed on the surfaces of Fe based alloys	S. Suzuki	• • •	252
Elemental analysis				
215	(ISIJ Young Researcher Award) Development of analytical method for the determination of the size distribution of nano-precipitates in steels	D. Itabashi		
216	Measurement of the limit of quantitation in atomic spectrometry with respect to the matrix effect	M. Uemoto	• • •	253
217	Is the standard deviation of the mean in the GUM acceptable?	J. Kawai	• • •	254

Program of the 181st ISIJ Meeting (March 17-19, 2021)

ISIJ and JIM Joint Sessions

Lecture No. Joint Session	Title	Speaker	Page
Titanium and its alloys 1			
J1	Manufacturing of titanium thin foil by continuous constant current electrodeposition (Manufacturing of high quality titanium thin foil by electrodeposition -4)	T. Kaneko	• • • 255
J2	Texture memory effect in HCP→BCC→HCP transformation in CP-Ti and its mechanism	T. Tomida	• • • 256
J3	The effect of grain size on yield stress in commercial pure titanium sheet	H. Takebe	• • • 257
Titanium and its alloys 2			
J4	Prediction for precipitation of α phase and third phase in titanium alloys based on energetics	Y. Toda	• • • 258
J5	Isothermal forging of the Ti-17 alloy and microstructural prediction with an internal-variable of dislocation density	H. Matsumoto	• • • 259
J6	Measurement for true stress-strain curves at elevated temperature and under controlling necking speed in Ti-17 alloy	A. Ito	• • • 260
J7	Development of Ti-Mn-Fe system near beta alloys	M. Ikeda	• • • 261
Ultrafine grained materials -fundamental aspects for ultrafine grained structures- 1			
J8	Effect of iron microstructure on reaction pathways	R. Umegaki	• • • 262
J9	Mechanical properties of harmonic structured CoCrFeMnNi high-entropy alloy	J. Yi	• • • 263
J10	Atomic simulations of lattice defect dynamics in harmonic structure metals	T. Shimokawa	• • • 264
Ultrafine grained materials -fundamental aspects for ultrafine grained structures- 2			
J11	In-situ evaluation of fatigue damage of austenitic stainless steel with harmonic structure by DCT using ultrabright synchrotron radiation	S. Kikuchi	• • • 265
J12	Improvement in mechanical properties of harmonic structured Ti through preferential recrystallization assisted grain refinement	B. Sharma	• • • 266
J13	High temperature deformation of SUS 316L harmonic structure material	S. Masuno	• • • 267
Physico-chemical properties of high temperature melts 1			
J14	Surface tension measurement of molten SiO ₂ -Na ₂ O-NaF system in wide composition range by maximum bubble pressure method	O. Takeda	• • • 268
J15	Molecular dynamics simulation of surface ionic distribution of Al ₂ O ₃ -CaO melt using polarizable ion model	M. Suzuki	• • • 269
J16	Thermal conductivity of alkali silicate melts and glasses	S. Sukenaga	• • • 270
J17	Solubility measurement in melt by 3D shape analysis of high-temperature solid/liquid interface	S. Kawanishi	• • • 271
J18	Viscosity evaluation of simulated foaming slag via interfacial reaction at room temperature	S. Hatano	• • • 272
Physico-chemical properties of high temperature melts 2			
J19	Thermophysical property measurements of high temperature oxide melts using an electrostatic levitation furnace onboard the international space station - Report 4	T. Ishikawa	• • • 273
J20	In-situ observation of infiltration of molten silicon into SiC-C preform	H. Esaka	• • • 274
J21	Anisotropy in infiltration of molten silicon into SiC-C preform	S. Ueda	• • • 275
J22	Nitrogen behavior in Cr-Ni solvent used for solution growth of AlN	S. Kurosaka	• • • 276
J23	Influence of atmospheric gas species on surface tension of liquid titanium and zirconium	Y. Seimiya	• • • 277