

Program of the 187th ISIJ Meeting (March 13-15, 2024)

Discussion Sessions

High Temperature Processes

Lecture No.				
Discussion Session	Title	Speaker		Page
Latest research aiming at Lumpy zone control for next generation hydrogen enriched blast furnace				
(Final report meeting of the study group on “Lumpy zone control for next generation hydrogen enriched blast furnace”)				
D1	Reduction disintegration mechanism of pellet under high hydrogen condition of blast furnace	K. Momma	• • •	1
D2	Degradation behaviors during steam gasification of coke	Y. Ueki	• • •	3
D3	Two-phase flow analysis on powder motion in void space of packed bed of blast furnace stack	H. Nogami	• • •	5
D4	Plastic deformation of self fluxed palettes	M. Tanaka	• • •	7
D5	Pellet softening and deformation behavior analyzed by ADEM	S. Ishihara	• • •	9
D6	Effect of fractional reduction on melt formation behavior at high temperatures	H. Konishi	• • •	11
D7	Evaluation of crystal precipitation and metallization of slag sections of sinter ore in reducing conditions	T. Watanabe	• • •	13
D8	Softening and melting behaviors of mixed burdens consisting of sintered ores, pellets, and lump ores under H ₂ reduction	S. Ueda	• • •	15
D9	Effect of reduced mineral structure on softening deformation of pre-reduced pellets under high temperature loading condition	K. Ohno	• • •	17
D10	Viscoelasticity evaluation of suspensions with high solid fraction	N. Saito	• • •	19
D11	Packed bed deformation analysis by dynamic model of sintered iron ore plastic deformation considering reduction degree	S. Natsui	• • •	21

Processing for Quality Products

Recent topics related to the manufacture of high tensile steel

D12	An online rolling model for plate mill considering Nb precipitation effect	T. Otsuka	• • •	23
D13	Effects on remaining oxide of joining conditions in sheet bar joining by induction heating	T. Okazaki	• • •	27
D14	Controlled rolling to manufacture high-strength manganese steels	J. Yanagimoto	• • •	29
D15	Development of on-line forward slip ratio models on the tandem cold strip mill	Y. Fujii	• • •	33
D16	The trend of a flattening facility for high strength material	R. Kumagai	• • •	37

Process Evaluation and Material Characterization

State-of-the-arts in chemical analyses of steel and iron

D17	Chemical verification of a spectrophotometric method for determination of silicon in steel samples	H. Mizuguchi	• • •	41
D18	Development of a simple colorimeter using a white color LED and color sensor and its application to identify an endpoint and digitize color changes on titration	Y. Suzuki	• • •	42
D19	(ISIJ Research Promotion Grant) The effect of coexisting ions on the corrosion of steel materials contacting with frozen aqueous solutions elucidated by image analysis of microscopic images	A. Inagawa	• • •	44
D20	Precipitation of cobalt at 1-nitroso-2-naphthol gravimetry for wet-analysis of steel	N. Uehara	• • •	45
D21	Precipitation of barium sulfonate for gravimetric analysis of sulfur in steel	N. Uehara	• • •	46
D22	Quantitative recovery of tungsten to improve the precision of gravimetric method for tungsten in steel	T. Kanamaru	• • •	47

Program of the 187th ISIJ Meeting (March 13-15, 2024)

International Organized Sessions

2024/3/14 Room 14

Lecture No.	Title	Speaker	Page
Recent advances in analytical techniques for metallic cultural heritage studies			
-Mainly focusing on the use of synchrotron radiation, neutron, and muon-			
10:30-10:35			
Opening address: M. Tanaka [Tokyo Univ. of the Arts]			
Chair: K. Nagata [Tokyo Tech.]			
10:35-10:55			
Int.-1	Principles and progress of muonic X-ray analysis	Osaka Univ. ○A. Sato	48
10:55-11:15			
Int.-2	Non-destructive depth-profiling elemental analysis for a bulk sample including chemical state information using muon beam	Osaka Univ. ○K. Ninomiya	50
11:15-11:45			
Int.-3	(Invited Lecture) Material history and the study of historic bronze sculptures and the contribution of research at the laboratory and large scale facilities	Rijksmuseum ○R. van Langh	51
Chair: J. Kawai [Kyoto Univ.]			
14:00-14:20			
Int.-4	History and advances of chemical analysis techniques used for cultural properties	Nippon Steel Technology ○H. Watanabe · M. Suehiro · A. Sakoda · M. Matsumoto · T. Nishi	52
14:20-14:40			
Int.-5	Microstructures and corrosion properties of japan-specific nails "Wakugi" used in wooden buildings in the early modern period	Nippon Steel Technology ○M. Suehiro · H. Watanabe · A. Sakoda · M. Matsumoto · T. Nishi	56
14:40-15:00			
Int.-6	Engineering science and art on the origin of high quality iron (so-called Tamahagane) from pre-modern in JAPAN	Kobelco Research Inst. ○Y. Matsui · M. Inui · S. Oishi · C. Hiraga · T. Wakabayashi · K. Kono	60
Chair: Y. Matsui [KOBELCO Research Institute]			
15:10-15:30			
Int.-7	Why does <i>tamahagane</i> exhibit beautiful colours? -Electron microscopes unveil the microstructure-	JFE Techno-Research ○K. Sato · K. Shibuya	61
15:30-15:50			
Int.-8	Milli-Watt XRF (X-Ray fluorescence) spectrometer for cultural heritage	Kyoto Univ. ○J. Kawai, Tohoku Univ. S. Imashuku	65
Chair: K. Ninomiya [Osaka Univ.]			
16:00-16:20			
Int.-9	Current status of high-energy X-ray micro-imaging at SPring-8	Japan Synchrotron Radiation Research Institute ○M. Hoshino · K. Uesugi	66
16:20-16:40			
Int.-10	Non-destructive analysis of ancient cast metals using synchrotron X-ray radiography and computed tomography	Tokyo Univ. of the Arts ○M. Tanaka, Japan Synchrotron Radiation Research Institute M. Hoshino, Gifu Prefectural Government Y. Mizutani, Fukuyama Museum of Art K. Harada	69
16:40-17:10			
Int.-11	(Invited Lecture) Smart*light: Bringing the synchrotron to the museum	Delft Univ. of Tech. ○M. Alfeld · J. Dik	70
17:10-17:15			
Concluding remarks: R. van Langh [Rijksmuseum]			
17:15-17:20			
Closing address: K. Sato [JFE Tecno-Research Corporation]			

Program of the 187th ISIJ Meeting (March 13-15, 2024)

High Temperature Processes

Lecture No.	Title	Speaker	Page
Plenary Session			
Coke			
1	(Nishiyama Commemorative Prize) Development of ironmaking raw material production technology suitable for reducing CO ₂ emissions	T. Yamamoto	71
2	Mechanism and countermeasure for adhesion of ferro-coke materials	S. Hiroike	72
3	Determination of porous microstructure of metallurgical coke using X-ray CT	M. Watanabe	73
Young engineer session of coke-making 1			
4	Method of obstacles removal for the combustion chamber of coke ovens	Y. Makino	74
5	Improvement of preventing pushing trouble coke-cake in deterioration coke ovens	T. Seito	75
6	Investigation of cause and countermeasure of the gate valve failure in TC outlet COG pipeline	H. Okada	76
7	Result report of overhaul the benzene collecting towers for COG purify plant	K. Kubota	77
Young engineer session of coke-making 2			
8	Reduction of joint pushing work in coke oven brickwork	I. Terakawa	78
9	Effect of iron ore on softening/melting and reducibility of Ferro-Coke	K. Horita	79
10	Evaluation of non-or-slightly-caking coal and effect on coke strength	S. Arakawa	80
11	Improvement of briquette strength in briquette production	N. Yamaguchi	81
Pretreatment of raw materials			
12	Developing continuous dephosphorization technique for iron ore with reduction gasification	O. Ishiyama	82
13	Rheology of wet ore powder and its granulation characteristics	H. Nakamura	83
14	Technology to prevent pellets bursting with using organic binder	Y. Kajiyama	84
Sinter			
15	(ISIJ Young Researcher Award) Study for improving the productivity and the quality on sintering process	K. Takehara	
16	Effect of coke and Al ₂ O ₃ content on sinter cake structures and yield	S. Fujiwara	85
17	Characterization of SFCA-III in iron ore sinter by EBSD method	R. Murao	86
18	Analysis of pore network in sintered ore by X-ray CT method and its relation with reduction behavior	T. Takayama	87
Non-metallic inclusion			
19	(Distinguished Article Award) A kinetic model to predict the compositions of metal, slag and inclusions during ladle refining	A. Harada	88
20	(Nishiyama Commemorative Prize) Development of inclusion control for stainless steel	Y. Ehara	89
21	(Nishiyama Commemorative Prize) Effect of oxide inclusion composition on TiN precipitation behavior	H. Ota	90
22	(Nishiyama Commemorative Prize) Research on the control and utilization of nonmetallic inclusions in steel	H. Hasegawa	91
23	Effects of composition and heat treatment on CaS formation in ferritic stainless steel	S. Kaneko	92
Current status and challenges in measurement and interpretation of thermophysical properties for molten oxides			
24	Compositional dependence of phonon mean free path in oxide glasses	S. Sukenaga	93
25	Dominant factor for thermal conductivity in silicate melts: a molecular dynamics study	M. Shimizu	94
26	Measurement conditions for thermal conductivity of oxide melts using transient hot-wire method -A study using finite element method-	Y. Kogo	95
27	(ISIJ Research Promotion Grant) Thermal conductivity of CaO-CaF ₂ -SiO ₂ melts	T. Nishi	96
Thermodynamics			
28	Measurements and reevaluation of thermochemical data for tri-calcium phosphate	K. Saito	97
29	Liquid-Liquid phase separation in CaO-FeO-P ₂ O ₅ ternary slag	Y. Uchida	98
30	Thermodynamic properties of VO _{1.5} in CaO-Al ₂ O ₃ -VO _{1.5} -SiO ₂ slag at 1873 K	D. Park	99
31	(Sawamura Award) Interaction coefficients of Mo, B, Ni, Ti and Nb with Sn in molten Fe-18mass%Cr alloy	H. Ono	100
32	(ISIJ Research Promotion Grant) Precipitation behavior of AlN inclusions in Fe-(0.5-2.0)mass%Al-2.0mass%Mn alloy under continuous unidirectional solidification process	K. Imai	101

Program of the 187th ISIJ Meeting (March 13-15, 2024)

Transport phenomena

33	Prediction model of nitrogen concentration behavior by N ₂ gas stirring	S. Takeda	• • •	102
34	Terminal settling velocity of particle in suspension	S. Shimasaki	• • •	103
35	(ISIJ Research Promotion Grant) Evaluation of behavior of bubble ascending in gallium alloy under a horizontal magnetic field using an ultrasonic tomography	H. Murakawa	• • •	104

Quantification of solidification phenomena IV 1

36	Effect of ultrasonic wave imposition starting time on eutectic ratio variance of solidifying eutectic alloy	K. Fujita	• • •	105
37	Peritectic solidification of Ag-Sn alloys by uni-directional solidification experiment	H. Harada	• • •	106
38	Crystallographic analysis of the austenite grains after a massive-like transformation in carbon steel using 4D-CT+XRD	M. Osaki	• • •	107
39	Crystal orientation analysis of bcc-hcp coexisting dendrites in solidifying TiAl-based alloys	Y. Imoto	• • •	108
40	Time-resolved X-ray diffraction measurement of austenite coarsening after a massive-like transformation in Fe-0.45C steel	Y. Wang	• • •	109

Quantification of solidification phenomena IV 2

41	Phase-field model for CALPHAD coupling: Closed-form expression for the interface composition satisfying local equilibrium	T. Morino	• • •	110
42	Estimation of grain rearrangement behaviour during semi-solid shear deformation by multi-phase-field lattice Boltzmann simulation	N. Yamanaka	• • •	111
43	Quantitative phase-field simulation of banded structure during rapid solidification	M. Ohno	• • •	112
44	Macrosegregation of Sn alloys formed by solidification shrinkage and columnar dendrites bridging	Y. Natsume	• • •	113
45	Numerical analysis of the effect of solidification shrinkage flow on dendrite growth	K. Ueno	• • •	114

Slag

46	Suppression of pulverization of CaO-SiO ₂ -Al ₂ O ₃ slag and its mechanism	S. Tashiro	• • •	115
47	Effect of MgO on phase structure and evolution of steelmaking slag during cooling	W. Gu	• • •	116
48	Recovering phosphorus and reducing steelmaking slag by leaching P-concentrated slag	T. Iwama	• • •	117
49	Influence of titrated Fe ³⁺ on FePO ₄ crystallization from steelmaking slag extract	J. Deng	• • •	118

Blast furnace

50	(Nishiyama Commemorative Prize) Technology development of low carbon blast furnace operation with low coke rate and life extension	K. Nakano	• • •	119
51	Effect of coke degradation with gasification reaction on gas permeability	T. Iwanaga	• • •	120
52	Estimation model of tap hole diameter in blast furnace	J. Kim	• • •	121

Ironmaking process in future

53	(Sawamura Award) Development of low carbon blast furnace operation technology by using experimental blast furnace	K. Nakano	• • •	122
54	Numerical simulations and experimental insights into hydrogen-rich blast furnace	Y. Chiu	• • •	123
55	Technology for accelerating pulverized coal combustion in oxygen blast furnace tuyere	Y. Morita	• • •	124
56	Evaluation for carburization rate of porous iron whisker with CO gas	R. Higashi	• • •	125
57	Development of fluidized bed H ₂ -based ironmaking process using low-grade fine ores- -Investigation of sticking tendency of low-grade fine ores-	Y. Nakahara	• • •	126

Electric arc furnace

58	Numerical simulation model of melting of solid phase in electric arc furnace	K. Kihara	• • •	127
59	Effect of MgO content in EAF slag on Cr yield	F. Kiriha	• • •	128
60	canceled			

Refractory

61	(Sawamura Award) Effects of particle size distribution of MgO and carbon on MgO-C reaction behaviour	Y. Hino	• • •	130
62	Improvement of durability of converter charging sidewall by application of high-fracture energy MgO-C bricks	Y. Yamashita	• • •	131
63	Interfacial reactions between Al ₂ O ₃ -based refractories and molten steels with different Mn concentrations	Y. Kawakami	• • •	132

Program of the 187th ISIJ Meeting (March 13-15, 2024)

Fundamentals of solidification and continuous casting

64	(ISIJ Young Researcher Award) Empirical study on deformation behavior in semisolid alloy	T. Narumi		
65	(Tawara Award) Transient boiling heat transfer characteristics of a moving hot surface during two-fluid flat spray quenching	H. Niitani	• • •	133
66	Effect of operating conditions on gas entrainment into molten steel flow	Y. Takemasa	• • •	134
67	Efficient and accurate data assimilation system for columnar dendrite growth	T. Takaki	• • •	135

Sustainable Systems

Lecture No.	Title	Speaker	Page
-------------	-------	---------	------

Advanced thermal energy utilization technologies for saving energy and reducing carbon emissions in steelmaking industry 1

68	Coke oven gas (COG) augmentation by reacting CO ₂ and unused hot carbon in coking chamber : 1 st demonstration of CO ₂ utilization in ironmaking industries	H. Park	• • •	136
69	Thermal storage performance of Ca ₂ AlMnO ₅₊₆ as chemical heat storage material	K. Tanahashi	• • •	137
70	Effect of aluminizing time for thickness of compound layer on the iron-based heat storage alloy	D. Maruoka	• • •	138

Advanced thermal energy utilization technologies for saving energy and reducing carbon emissions in steelmaking industry 2

71	Thermal and high-temperature compressive properties of Al-Cu-Si alloy-based latent heat storage pellet	Y. Shimizu	• • •	139
72	Catalytic and thermal control performance of Ni/(Al-Si) MEPCM catalyst on NH ₃ decomposition	C. Tamzysi	• • •	140
73	Evaluation of heat storage and release performance in a bench scale packed bed latent heat storage system with 600°C scale medium to high-temperature latent heat storage pellets	T. Nakamura	• • •	141

Recycle

74	Silicon as a carbon free reductant: elemental phosphorus production from phosphoric acid	A. Okamoto	• • •	142
75	(ISIJ Research Promotion Grant) Reforming effect of silicate type surface penetrants on mortar mixed with blast furnace slag	T. Kondo	• • •	143
76	Rapid sorting and classification of automotive steel plates using laser-induced breakdown spectroscopy and machine learning	K. Tomono	• • •	144

Current state of Slag2PCC (CO₂ mineralization process) for achievement of carbon neutrality

77	Development of carbonation technology for steelmaking slag	M. Hiyoshi	• • •	145
78	Preparation of calcium carbonate spherical hollow particles from steelmaking slag by spray drying and its properties	S. Onodera	• • •	146
79	Properties of calcium carbonate spherical hollow particles obtained by spray drying from calcium extract solution prepared by carbonic acid extraction method	T. Toyama	• • •	147

Instrumentation, Control and System Engineering

Lecture No.	Title	Speaker	Page
-------------	-------	---------	------

System, Control and Instrumentation

80	Optimization of casting lot planning using column generation method	K. Maehisa	• • •	148
81	Development of a logistic simulator for stable operation of coal blending plants	A. Kumano	• • •	149
82	Development of Automatic grinding robot system for steel pipe	T. Watanabe	• • •	150
83	The looper tension control of wire-rod mill for zero manual intervention	S. Lee	• • •	151
84	Continuous measurement of iron-slag outflow temperature at blast furnace	M. Sugiura	• • •	152

Processing for Quality Products

Lecture No.	Title	Speaker	Page
-------------	-------	---------	------

Hot Rolling, Cooling, Control 1

85	(Tawara Award) Influence of thickness profile after sizing press on width profile at head and tail portions of slab	H. Goto	• • •	153
86	(ISIJ Young Researcher Award) Study on cooling of moving high temperature steel plates with water coolant	K. Tatebe		
87	Collision behavior and cooling phenomenon of droplet train obliquely impinging on a moving hot solid	K. Tatebe	• • •	154

Program of the 187th ISIJ Meeting (March 13-15, 2024)

Hot Rolling, Cooling, Control 2

88	(Mishima Medal) Research and development on surface control of steel in hot manufacturing process	Y. Hidaka		
89	(Nishiyama Commemorative Prize) Process development of hot rolling technology for high tensile strength steel	S. Fukushima	• • •	155
90	The strip wedge control and setup in hot strip mill finisher(high speed control)	Y. Anbe	• • •	156
91	Prediction of vibration modes causing roll polygonization in rolling machines	R. Arora	• • •	157

Tribology

92	(Nishiyama Commemorative Prize) <i>in situ</i> observation of lubrication phenomenon during forging with oscillation and image analysis	R. Matsumoto	• • •	158
93	Micro-plasto hydrodynamic lubrication in cold rolling of steel sheet 2 (Influence of surface roughness of steel sheet)	S. Inagaki	• • •	159
94	Micro-plasto hydrodynamic lubrication in cold rolling of steel sheet 3 (Influence of surface roughness of roll)	T. Nishimura	• • •	160
95	Effect of microstructure on adhesion force of steel	N. Kikuchi	• • •	161

Process, sensing

96	(Scientific Achievement Merit Prize) Establishment of transformation-free solid phase joining methods for steel plates	H. Fujii		
97	(Shiraishi Commemorative Prize) Metal laser powder bed fusion process simulation	M. Watanabe		
98	(Nishiyama Commemorative Prize) Elucidation of solidification behaviors during welding/casting using synchrotron X-ray	T. Nagira	• • •	162
99	Analysis of anisotropy fracture during bulge forming in inconel alloy	K. Toyama	• • •	163

Bar and wire

100	(Shiraishi Commemorative Prize) Research on surface quality improvement of wire rod and bar rolling	H. Kushida		
101	Predicting ductile fracture during torsion testing of a bar using dislocation density tensor	K. Komori	• • •	164
102	Atomistic mechanism of defects formation and microstructural change in metal wire drawing (Molecular dynamics simulation of polycrystalline Mg wire)	K. Saitoh	• • •	165

Cutting and surface

103	Influence of heat treatment on tool wear of high-carbon steel (S55C)	R. Mineta	• • •	166
104	Influence of mill scale on tool wear of heat treated high-carbon steel (S55C)	H. Ohnishi	• • •	167
105	Effect of tools on cutting behavior and surface microstructure in turning Ti-6Al-4V at cutting speeds of 120-310m/min	K. Ishitaka	• • •	168
106	Performance and film structure of developed organic-inorganic type chromate-free treatment	K. Ueda	• • •	169
107	Influence of shot ejection pressure on hot shot peening effect	T. Miyake	• • •	170

Microstructure and Properties of Materials

Lecture No.

Plenary Session	Title	Speaker	Page
-----------------	-------	---------	------

Electrical steel

108	Crystal orientation change of Fe-3%Si by simple shear deformation	N. Wada	• • •	171
109	Deformation behavior of 3%Si steel in tensile test	Y. Shingaki	• • •	172
110	Non-destructive fast orientation mapping using line-beam scanning three-dimensional X-ray diffraction microscopy	Y. Hayashi	• • •	173
111	The effect of Mn addition on the oxidation behavior of Fe-Si steel sheet	M. Fukuchi	• • •	174

Diffusional and nondiffusional transformation 1

112	Crystallographic characteristics of as-quenched martensitic steel	K. Yoshida	• • •	175
113	Energy dissipation for austenite/ferrite interface migration during continuous cooling process in 0.3%C steels	K. Yamashita	• • •	176
114	A mechanism for dependency of Ms on grain size of austenite II	T. Tomida	• • •	177
115	(Scientific Achievement Merit Prize) Phase transformation and microstructure control in alloys	K. Tsuchiya		

Program of the 187th ISIJ Meeting (March 13-15, 2024)

Diffusional and nondiffusional transformation 2

116	Effect of initial bainite structures on grain refinement behavior of reverted γ in Ni-Cr-Mo-V steel	T. Noto	• • •	178
117	Formation of dual martensitic structure with high strength and high ductility through reverse transformation from coarse ferrite + Mn rich cementite structure in 0.1C-2Si-5%Mn steel	S. Torizuka	• • •	179
118	Re-visiting the alloy design for the synthesis of fine-structured austenitic-martensitic composites in Fe-Mn-C system	M. Muench	• • •	180
119	Effect of Si addition on reverted γ formation behavior during intercritical annealing in steel sheet containing Mn	K. Endoh	• • •	181

Hydrogen embrittlement 1

120	H-induced defects in austenitic stainless steel by operando positron annihilation spectroscopy	M. Fujinami	• • •	182
121	Effect of stacking fault energy on hydrogen embrittlement of stable austenitic stainless steels	D. Kudo	• • •	183
122	Mechanical and fatigue crack growth properties of 18Cr-4.8Ni low carbon stainless steel in high-pressure hydrogen environment	K. Kubota	• • •	184
123	Relationship between microstructure and hydrogen trapping properties of rapidly tempered high Si steel	M. Sunako	• • •	185

Hydrogen embrittlement 2

124	Hydrogen charging method at high temperature to promote hydrogen diffusion into austenitic stainless steel	R. Ookuma	• • •	186
125	Internal hydrogen SSRT test of austenitic stainless steel cathodic hydrogen charged at high temperature	R. Ookuma	• • •	187
126	(ISIJ Research Promotion Grant) Effects of NH_4SCN concentration and pH on hydrogen absorption behavior into iron sheet during cathodic hydrogen charging	S. Ajito	• • •	188
127	Effect of rust on hydrogen entry into steel under atmospheric corrosion environment	M. Kawamori	• • •	189
128	Delayed fracture behavior of resistance spot-welded I-type joints of ultra-high strength steel sheet	N. Hashimoto	• • •	190

Ductility and toughness

129	Estimation method of stress-strain relationship for micro areas using pyramid indentation test	T. Sakamaki	• • •	191
130	New equation of cleavage fracture and grain boundary fracture stress	K. Hyodo	• • •	192
131	Suppression of deformation-induced martensitic transformation of metastable austenitic weld metal due to temperature rise during Charpy impact test	X. Yuan	• • •	193
132	(Nishiyama Commemorative Prize) Research and development of high-strength, high-toughness steel plates and their welding technologies	R. Homma	• • •	194

Recrystallization and texture 1

133	(Mishima Medal) Crystalline texture control by thermos-mechanical treatment in steel sheets	K. Okuda		
134	Analysis of ferrite recrystallization in low-carbon steels with different initial microstructures (1): Relationship between dislocation characteristics and ferrite recrystallization	H. Dannoshita	• • •	195
135	Analysis of ferrite recrystallization in low-carbon steels with different initial microstructures (2): Role of ferrite recrystallization on microstructural evolution during intercritical annealing	T. Ogawa	• • •	196

Recrystallization and texture 2

136	Effect of Mn content on the recrystallization behavior of austenite in medium Mn steels	M. Takanashi	• • •	197
137	Effect of carbide morphology on continuous dynamic recrystallization process by burnishing	Y. Amano	• • •	198
138	Microstructural changes in AISI 420 stainless steel containing Nb or Ti during solution nitriding treatment	C. Furusho	• • •	199
139	The effect of hot working conditions for grain size distribution on Alloy925	M. Yanagihara	• • •	200

Aging and precipitation

140	(Sawamura Award) Formation mechanism of pearlite colony by multiple orientation relationships between ferrite and cementite	N. Nakada	• • •	201
141	Precipitation behavior of α -Cr phase in Ni-Cr binary system	R. Nagashima	• • •	202
142	Interfacial precipitation of core-shell structured carbides in V-Nb multiple micro-alloyed steels	Y. Kawahara	• • •	203
143	Growth of V(C,N) precipitates at the interface between recrystallized and unrecrystallized grains in work-hardened austenite in V-added high carbon steel	Y. Kobayashi	• • •	204

Surface treatment and corrosion 1

144	Effect of Ni as impurities in metal bath on corrosion resistance of 55%Al-Zn alloy coated steel sheets	M. Yoshida	• • •	205
145	Effect of metallic coating composition on initial corrosion of pre-painted Zn-Al-Mg coated steel	M. Matsumoto	• • •	206
146	Effect of strain on behavior of Mn, Si external oxidation in 2Mn-1Si steel	N. Kirekawa	• • •	207

Program of the 187th ISIJ Meeting (March 13-15, 2024)

Surface treatment and corrosion 2

147 (ISIJ Young Researcher Award • ISIJ Research Promotion Grant) Study on the influence of environmental factors on corrosion in soil	A. Ooi		
148 Rust effect on hydrogen desorption from steel (2)	M. Akahoshi	• • •	208
149 (ISIJ Research Promotion Grant) Quantification of rust distribution rate and fatigue strength of corroded high-strength galvanized steel wires for bridges	K. Miyachi	• • •	209

Structural steel

150 (Nishiyama Commemorative Prize) Development of steels for machine structural use that contribute to reducing environmental impact	N. Tsunekage	• • •	210
151 (Nishiyama Commemorative Prize) Development of high-strength steels for mechanical structures by precipitation control	S. Teramoto	• • •	211
152 Numerical analysis of carbon diffusion with carbide formation under low pressure carburizing	Y. Muto	• • •	212
153 Effect of graphite muffle for steel quenching by nitrogen atmosphere	K. Shimoda	• • •	213

Hydrogen embrittlement 3

154 Relationship between lattice defect formation during the incubation period of hydrogen embrittlement and fracture morphology of pure iron	Y. Sugiyama	• • •	214
155 Interaction between hydrogen atoms and dislocation movement in high strength martensitic steel	K. Saito	• • •	215
156 States of hydrogen and hydrogen embrittlement susceptibility of flake and spheroidal graphite cast irons	R. Umehara	• • •	216
157 Comparison of hydrogen embrittlement susceptibility of tempered martensitic steels adding Mo and Mo-V	K. Kagiya	• • •	217

Hydrogen embrittlement 4

158 First-principles study of the effect of Mo addition on hydrogen segregation at α -Fe grain boundaries	K. Ito	• • •	218
159 (Tawara Award) Effect of residual stress on hydrogen embrittlement at sheared edge	Y. Sakiyama	• • •	219
160 Atomic-scale observation of hydrogen trap sites of ϵ -carbide and cementite in steels	J. Takahashi	• • •	220
161 In-situ 0.3mm thin wall hollow high pressure hydrogen low temperature tensile test with X-ray diffraction using synchrotron radiation	S. Torizuka	• • •	221
162 (ISIJ Research Promotion Grant) Impact of hydrogen on fracture strength of $\langle 110 \rangle$ twist grain boundaries in α -Fe	K. Nakagawa	• • •	222

Stainless steels

163 (ISIJ Research Promotion Grant) Temperature dependence of work hardening behavior in nitrogen-bearing austenitic stainless steel	T. Ma	• • •	223
164 Effect of C, N, and Mn on tensile properties of overaged 17-4PH with residual austenite	K. Nishimoto	• • •	224
165 Effect of carbon content on sliding wear properties in martensitic stainless steels	T. Yoshizawa	• • •	225
166 Effect of S on surface roughness during low speed cutting	Y. Oka	• • •	226
167 Effect of 2% Al content on recrystallized behavior in hot rolled 18%Cr Steel Sheet	R. Kobayashi	• • •	227

Strength and deformation behavior 1

168 (Nishiyama Commemorative Prize) Development of high strength sheet steels with high performance for automobile body	S. Kaneko	• • •	228
169 Strain induced transformation behavior of ferrite + austenite duplex steel	S. Ikegami	• • •	229
170 The grain size effect on cyclic transformation strengthening in an Fe-24Ni-0.3C TRIP steel	M. Dono	• • •	230
171 Effect of hydrogen on spot weldability in ultrahigh-strength steel sheets	Y. Kondo	• • •	231
172 Effects of C and Mn contents on warm V-bending and hydrogen embrittlement in ultrahigh-strength TRIP-aided dual-phase steel sheets	S. Aoki	• • •	232

Strength and deformation behavior 2

173 Influence of laminating Cu layers on deformation and fracture behaviors in martensitic steel	N. Koga	• • •	233
174 Improvement of fatigue limit by pre-fatigue deformation in 1.6 GPa as-quenched martensitic steel	K. Okada	• • •	234
175 Effect of block size for dislocation density of high temperature tempered lath martensite	K. Miura	• • •	235
176 Shear band development in bending of a martensite steel	Y. Asada	• • •	236
177 (Sawamura Award) Factors dominating damage evolution in a Fe-5Mn-0.1C medium Mn steel: Effects of martensitic transformation	M. Koyama	• • •	237

Program of the 187th ISIJ Meeting (March 13-15, 2024)

Control of microstructure and properties

178	3D microstructure generation based on three slice images of dual phase steels using Generative Adversarial Network	K. Sugiura	• • •	238
179	Development of machine learning model to predict hardness-distribution of nitrided steels	G. Miyamoto	• • •	239
180	A measurement of grain boundary segregation width by STEM-EDS	Y. Murata	• • •	240
181	Thermodynamic analysis of grain boundary segregation in Fe-P-Mn alloys	M. Egami	• • •	241

Modeling and simulation

182	Modelling of NbC precipitation and grain growth behavior in Nb added steel during pseudo carburizing	Z. Wang	• • •	242
183	Inverse estimation of parameters in phase-field model for $\gamma \rightarrow \alpha$ transformation in steel	K. Nakayama	• • •	243
184	(Tawara Award) Modeling of loading-path dependent martensitic transformation in a low-alloy TRIP steel	T. Yasutomi	• • •	244
185	Maximization of the strength-ductility balance of dual phase steel through generative adversarial networks and Bayesian optimization	Y. Fukatsu	• • •	245

Heat resistant steels and alloys 1

186	Creep properties of modified 9Cr-1Mo steel manufactured by laser powder bed fusion	T. Hatakeyama	• • •	246
187	Microstructural characteristics of P91 steel with low creep ductility	N. Sekido	• • •	247
188	Creep deformation behavior of Modified 9Cr-1Mo steel in transient region and difference from that of other steels	F. Abe	• • •	248

Heat resistant steels and alloys 2

189	Relationship between precipitation behavior of fine carbide particles and mechanical properties in a heat-resistant austenitic stainless steel	N. Kitagawa	• • •	249
190	Grain-boundary precipitation strengthening effect by P (TCP) phase in creep of Ni-Cr-Mo alloy	T. Yanagiya	• • •	250
191	Effects of grain size and grain boundary precipitates on room temperature tensile properties of Fe-Cr-Ni-Nb based heat resistant austenitic steels	B. Li	• • •	251
192	Analysis on mechanical properties and dislocation densities of 3D fabricated Hastelloy-X alloy	A. Ito	• • •	252

Hydrogen embrittlement 5

193	Numerical study on hydrogen thermal desorption spectra of high-carbon α - γ dual phase steel	K. Ebihara	• • •	253
194	Hydrogen trapping energy of edge dislocation core in bcc iron: First-principles calculations	M. Yamaguchi	• • •	254
195	Investigation of the effects of solute hydrogen on the deformation behavior of SUS310S <i>via</i> in situ neutron diffraction	T. Ito	• • •	255
196	Criteria for the nucleation of hydrogen embrittlement cracks in Ni-based superalloy 718	Y. Ogawa	• • •	256

Hydrogen embrittlement 6

197	Effect of prior austenite grain size on hydrogen embrittlement behavior in high-strength martensitic steel	X. Lan	• • •	257
198	Multi-scale analysis on hydrogen-related intergranular fracture in martensitic steel	A. Shibata	• • •	258
199	(Sawamura Award) Mechanism of hydrogen-related quasi-cleavage fracture in ferritic steel	K. Okada	• • •	259
200	Influence of hydrogen on the dislocation structure of an austenitic FeMnAlC low-density steel	I. Gutierrez	• • •	260

Strength and deformation behavior 3

201	Multimodal analysis of austenite transformation behavior in TRIP steels at bending deformation	T. Takefuji	• • •	261
202	Analysis of plastic deformation behavior of the ferrite-martensite dual-phase steels	K. Kinoshita	• • •	262
203	Martensite transformation and strain partitioning in a medium carbon quenching and partitioning steel	W. Yin	• • •	263
204	Effect of Q&P processed microstructure on stress state dependent fracture limit of ultra high strength steel	T. Kitagawa	• • •	264
205	Effect of Ni on tensile properties at room temperature of rolled Fe-Cr-Ni-N alloys	K. Koganezawa	• • •	265

Strength and deformation behavior 4

206	Crystal plasticity analyses of elasto-plastic deformation and dislocation accumulation in the vicinity of pearlite colony brock boundary	Y. Yasuda	• • •	266
207	Thermal activation process of plastic deformation in single-crystal micropillars of Fe-Cr binary alloys	N. Takata	• • •	267
208	In situ TEM observation of the interaction between screw dislocations and prismatic dislocation loops in BCC iron	T. Inoue	• • •	268
209	In-situ meso scale observation of heterogeneous deformation behavior in ultra-low carbon ferritic steel	Y. Sato	• • •	269
210	Quantification of plastic deformation by digital image correlation method and electron backscatter diffraction method	K. Ueno	• • •	270

Program of the 187th ISIJ Meeting (March 13-15, 2024)

Process Evaluation and Material Characterization

Lecture No.	Title	Speaker	Page
Plenary Session			
Elemental analysis 1			
211	(Shiraishi Commemorative Prize) Development of chemical analysis methods for steels and slags on environmental aspects	M. Aimoto	
212	Accuracy evaluation in quantitative determination of boron	T. Sumita	• • • 271
213	Characterization of diffusion of alloying and impurity elements in solid iron by analytical techniques	S. Suzuki	• • • 272
Elemental analysis 2			
214	(Mishima Medal) Understanding origin of mechanical properties by nanostructure analysis	T. Sasaki	
215	(Nishiyama Commemorative Prize) Rapid analysis for steel related materials using cathodoluminescence	S. Imashuku	• • • 273
216	Microscopic characterization of low molecular weight organic acids containing ferrous ions or ferric ions	S. Suzuki	• • • 274
Crystal structure analysis			
217	(Nishiyama Commemorative Prize) Microstructural analysis for investigating of the effects on mechanical properties of steels	H. Nakamichi	• • • 275
218	(ISIJ Young Researcher Award) Development of X-ray diffraction analysis method and thermodynamic calculation model for iron sintered ores	T. Harano	
219	Effects of alloying elements on dislocation multiplication and dislocation motion during high temperature deformation	S. Karasawa	• • • 276
220	In-situ X-ray diffraction measurements of steels in compression process	S. Sugano	• • • 277

Program of the 187th ISIJ Meeting (March 13-15, 2024)

ISIJ and JIMM Joint Sessions

Lecture No. Joint Session	Title	Speaker	Page
Titanium and its alloys 1			
J1	CRSS evolution of a Ti-6Al-2Sn-4Zr-2Mo-Si alloy with equiaxed ($\alpha+\beta$) microstructures: effects of grain size and β fraction	I. Sechepee	• • • 278
J2	Influence of process conditions on forging and microstructure for aerospace engine Ti alloys: Internal state variables model and machine learning	H. Matsumoto	• • • 279
J3	A study on precipitation-behaviors of Ti-5553 alloy using HREM method	E. Sakedai	• • • 280
J4	Effect of substitution site on ω phase transformation in β -Ti alloys	H. Tashiro	• • • 281
J5	Mechanistic origin of the grain size and oxygen interstitial effects on strain-induced α'' martensitic transformation in Ti-12Mo alloy	Y. Chong	• • • 282
Titanium and its alloys 2			
J6	(Asada Medal) Microstructure control of Ti-Mo beta titanium alloys through thermomechanical treatments	S. Emura	
J7	Effects of twinning deformation on work hardening behavior in commercially pure titanium	G. Tsukamoto	• • • 283
J8	Crystallographic features of titanium foils manufactured with direct electro-deposition route	T. Kaneko	• • • 284
J9	Improvement of an open atmosphere focused pulsed laser nitrided Ti surface with a controlled laser-induced plasma	A. Yoshino	• • • 285
Titanium and its alloys 3			
J10	Origin of oxygen effect on mechanical behavior of TRIP/TWIP type metastable β titanium alloys	X. Wang	• • • 286
J11	Effect of addition of interstitial atoms by diffusion from oxidized surface on mechanical properties of Ti-4.5Al-3V-2Fe-2Mo alloy sheet	T. Yamamoto	• • • 287
J12	Microstructure and high-temperature strength of precipitation strengthened Ti-Al-Mo-O alloy	H. Okawa	• • • 288
J13	Alternating shear fatigue crack growth and damage accumulation fatigue crack propagation in single-colony structures of Ti-6Al-4V lamellar alloy	S. Ueki	• • • 289
J14	Surrogate-based optimization for fatigue crack initiation behavior in Ti-6Al-4V alloy	F. Shuo	• • • 290
Physico-chemical properties of high temperature melts 1			
J15	Normal spectral emissivity measurement of Ti-Nb melts using electromagnetic levitation technique	M. Adachi	• • • 291
J16	Influences of oxygen adsorption on surface tension of molten Fe-Cu alloys	Y. Seimiya	• • • 292
J17	Measurement of thermophysical properties of V melts and application of Mott's theory to thermal diffusivity	M. Watanabe	• • • 293
J18	Effects of Oxygen adsorption on surface tension of Fe-Ni and Fe-Cr binary alloy	G. Horiuchi	• • • 294
Physico-chemical properties of high temperature melts 2			
J19	Viscosity measurement of gas-liquid multi-phase fluid with single sphere pulling method	S. Sugi	• • • 295
J20	Viscosity measurement of ZrO ₂ beads dispersed molten SUS316L	K. Nakanishi	• • • 296
J21	Variation of incorporation limit of molybdenum in sodium silicate glasses with the addition of rare-earth oxides	Q. Huang	• • • 297
J22	Evaluation of correspondence between thermophysical property distribution and phase distribution in lunar regolith simulant(FJS-1)	S. Watanabe	• • • 298