

# The 103rd ISIJ Meeting Programme

## POSTER SESSIONS

### -- IRONMAKING --

APRIL 3, 1982 10:00 - 12:00

- 1 Physical properties of coal-water slurry as coal-based energy.  
Hiroyuki Ishimatsu, et al. .... S1
- 2 Uniform injection test of slurry with circulating loop system.  
(Development of injection technique of petroleum coke-oil slurry into blast  
furnace--II). Mikio Deguchi, et al. .... S2
- 3 Atomization of auxiliary fuels for blast furnace. Yasuo Kamei, et al. .... S3
- 4 Combustion of pulverized coal in blast furnace. Teruhisa Shimoda, et al. .... S4
- 5 Development of a mass flow meter for blast furnace coal injection.  
Tadaaki Iwamura, et al. .... S5
- 6 Low temperature induration of water glass bonded briquettes.  
Shigeo Matsubara, et al. .... S6
- 7 Pilot plant test of new cold bonded pellet process. (Investigation of  
cold bonded pellet--VI). Seiji Matsui, et al. .... S7
- 8 Effect of mineral differences and particle size of feed ores on high  
temperature properties of cold bonded pellets. Ryo Watanabe, et al. .... S8
- 9 Desulfurization test of dust pellet by preheating treatment.  
Katsuyoshi Fukami, et al. .... S9
- 10 Reduction of carbon coated iron ore briquette by rotary kiln.  
(Production of direct reduced iron using petroleum residue--II).  
Dentaro Kaneko, et al. .... S10

### -- STEELMAKING --

APRIL 2, 1982 13:00 - 15:00

- 11 Connection and development of hot metal treatment and the combined blowing  
process. (Investigation of STB process--V). Shōji Anezaki, et al. .... S11
- 12 Operation of pretreatment of hot big iron and the reaction of them in  
converter. Masaho Kimura, et al. .... S12
- 13 The characteristics of decarburization of dephosphorized hot metal.  
(Decarburization of dephosphorized hot metal--I).  
Yasuhisa Nakamura, et al. .... S13
- 14 Quantitative study of splash in top and bottom blowing converter--I.  
(Decarburization of dephosphorized hot metal--II). Yasuyuki Nakao, et al. .... S14
- 15 Results of slag less refining test in converter. (Decarburization of  
dephosphorized hot metal --III). Akiyoshi Minami, et al. .... S15
- 16 Influence of oxygen on the dephosphorization by soda ash.  
Shinji Kuriyama, et al. .... S16
- 17 Oxygen potential at slag-metal interface during dephosphorization of  
C-sat. iron by soda ash. Kazuhiro Nagata, et al. .... S17
- 18 Dephosphorization of pig iron with lime-oxygen injection in 100-kg induction  
furnace. Toshiyuki Kaneko, et al. .... S18
- 19 Measurement of heat capacity and thermal conductivity of molten slag by  
laser flash method. Toshikazu Sakuraya, et al. .... S19
- 20 Estimations of oxygen and nitrogen absorptions of molten steel during tapping  
from the converter. Takao Choh, et al. .... S20
- 21 Measurements of bubble dispersion within molten iron contained in a small  
induction furnace. Masahiro Kawakami, et al. .... S21

\* Tetsu-to-Hagané, 68(1982), No. 4 contains S1 to S323 preprints in Japanese of Poster Sessions and Paper Presentations and Tetsu-to-Hagané, 68(1982), No. 5 does S325 to S664 preprints of them.  
The preprints of Symposia were published in Tetsu-to-Hagané, 68(1982), No. 2, A1 to A116, in Japanese.

-- PROPERTIES OF IRON AND STEEL --

APRIL 1, 1982 13:00 - 17:00

- 22 Relation between temper embrittlement and acoustic emission in  $2\frac{1}{4}$ Cr-1Mo pressure vessel steel. Yoji Matsumoto, et al. .... S325
- 23 Quantitative evaluation of hydrogen embrittlement susceptibility in temper embrittled  $2\frac{1}{4}$ Cr-1Mo steels by fracture toughness test. Isamu Takagi, et al. .... S326
- 24 Convenient evaluation method on hydrogen embrittlement susceptibility in various temper embrittled  $2\frac{1}{4}$ Cr-1Mo steels. Isamu Takagi, et al. .... S327
- 25 Effect of environments and corrosion conditions on HIC of line pipe steel. (Study on fracture behaviour of line pipe steel under sour gas environment --V). Yasuo Kobayashi, et al. .... S328
- 26 On the mechanism of hydrogen induced cracking of steel in the wet hydrogen sulfide environment. Akio Ikeda, et al. .... S329
- 27  $J_{IC}$  values of CT specimens with side grooves by the DCGC method. Toshiya Akiyama, et al. .... S330
- 28 Metallurgical factors controlling the scatter of crack opening displacement. Yokimi Kawashima, et al. .... S331
- 29 Evaluation of correlation and extrapolation of creep rupture data by generalized regression method. Akihiro Matsuzaki, et al. .... S332
- 30 Long time creep data and 100 000 h creep strength for carbon steel plate (SB49). Shin Yokoi, et al. .... S333
- 31 Creep rupture strength and strain-time data for Alloy 800H. Akimitsu Miyazaki, et al. .... S334

SYMPOSI A

-- IRONMAKING --

APRIL 1, 1982 13:00 - 17:00 Chairman: Motohiko Iizuka

Theme I. Oilless Operation Technique of Blast Furnace

- 1 Technical problems of oilless operation and present status of alternative fuel injection technique on blast furnace. Hiromitsu Takahashi, et al. .... A1
- 2 On the defects and improving methods of oilless blast furnace operation. Yoshio Okuno, et al. .... A5
- 3 COM injection into all tuyeres of Kashima No. 3 Blast Furnace, Sumitomo Metal Industries, Ltd. Ichiro Kurashige, et al. .... A9
- 4 Injection technique of tar-coal mixture into a blast furnace. Hiroshi Saito, et al. .... A13
- 5 Pulverized coal injection into No. 1 Blast Furnace at Oita Works, Nippon Steel Corp. Masaki Baba, et al. .... A17

-- STEELMAKING --

APRIL 3, 1982 13:00 - 17:00 Chairman: Kazumi Mori  
Vice-Chairman: Kiminari Kawakami

Theme II. Developments of New Steelmaking Processes in BOF

- 6 Equilibria and kinetics of slag-metal reactions. Katsumi Mori, et al. .... A21
- 7 Development of top and bottom blowing process in BOF. Seiichi Masuda, et al. .... A25
- 8 Mixing effect and metallurgical characteristics in LD circulating lance process. Yoshihiko Kawai, et al. .... A29
- 9 On the new blowing process by top and bottom blowing converter. Shuzō Itō, et al. .... A33
- 10 Metallurgical and blowing characteristic in the LD-OB process. Kazuo Okohira, et al. .... A37
- 11 Characteristics of bath mixing and metallurgical reactions in Q-BOP, LD, and top and bottom blowing processes. Kenji Saito, et al. .... A41

--PLASTIC WORKING AND OTHER FABRICATION PROCESSES --

APRIL 1, 1982 13:00 - 17:00 Chairman: Shigemi Ando

Theme III. On the Manufacturing Processes and Properties of Zn and Zn-alloy Plated Steel Sheets

- 12 Hot-dipped one-side galvanizing steel sheet produced by stop-off coating process. Syoji Sijima, et al. .... A45
- 13 Research and development of one-side hot dip galvanizing process. Yutaka Ohkubo, et al. .... A49

14	Research and development of one-side hot dip galvanizing process --E.M.P./U.C.P.--. Yoshio Kitazawa, et al. ....	A53
15	Protective properties of the Zn-alloy plating. Joji Oka, et al. ....	A57
16	Ni-Al alloy plated steel sheet with high corrosion resistance. Atsuyoshi Shibuya, et al. ....	A61
17	Production of Zn-Ni alloy plated steel sheet. Takao Saito, et al. ....	A65
18	Development of double-layer alloy-electroplated steel sheet. Shibeki Kirihara, et al. ....	A69

-- PROPERTIES OF IRON AND STEEL --

APRIL 3, 1982      13:00 - 17:00

Chariman: Shozo Abeyama

Theme IV. Progress in Free Machining Steel Technology

19	A review on the researches of free machining steels. Toru Araki. ....	A73
20	Machinability improvement of steels. Sadayoshi Furusawa, et al. ....	A77
21	Machinability of free machining steels with ferritic-martensitic duplex structure. Shigeo Yamamoto, et al. ....	A81
22	Quality of low carbon resulphurized free machining steel through continuous casting process. Yoshiji Yamamoto, et al. ....	A85
23	Application of free machining steel wire to cold forging. Tetsu Ohno, et al. ....	A89
24	Feasibility studies of free machining microalloyed steels for automobile components. Makoto Osawa, et al. ....	A93
25	The merits of free machining steels in mass production lines. Masahiro Kuwahara. ....	A97

Chairman: Hiroshi Mimura

Theme V. Ductile Fracture in Steel Structure

26	The effects of notch acuity on ductile fracture characteristics. Takeo Suzuki, et al. ....	A101
27	A study on stable ductile crack growth and unstable fracture initiation based on J and crack opening anlge concepts. Shuji Aihara, et al. ....	A105
28	Fracture absorbed energy of materials with regard to propagating shear fracture of line pipes. Masatoshi Tsukamoto, et al. ....	A109
29	Evaluation of resistance to propagating shear fracture of UOE pipe by West- Jefferson type test. Yoshihiro Kataoka, et al. ....	A113

PAPER PRESENTATIONS

-- IRONMAKING --

APRIL 1, 1982

1	On the decrepitation of self-fluxed pellet. Kaoru Itao, et al. ....	S22
2	Production test of various carbon materials content pellet. (High temperature properties of pellet--III). Noboru Sakamoto, et al. ....	S23
3	High temperature reduction and softening properties of high ratio mixed of pellet. (The effect of the high temperature property of blast furnace burdens. Kenzi Nosima, et al. ....	S24
4	Effect of CaO/SiO <sub>2</sub> and MgO on the high temperature reduction properties of pellet. Tsutomu Ikeda. ....	S25
5	New trends in dri applications. Paul Quintero, et al. ....	S26
6	Hot agglomeration of iron ore using petroleum residue. (Production of direct reduced iron using petroleum residue--I). Yoshifumi Kameoka, et al. ....	S27
7	Properties of cement bonded cold pellet containing char. Masao Ishi, et al. ...	S28
8	Continuous curing method of cold bonded pellets. (Investigation of cold bonded pellets--IV). Hideyuki Yoshikoshi, et al. ....	S29
9	Design and construction of newly developed cold pellet pilot plant. (Investigation of cold bonded pellet--V). Osamu Tajima, et al. ....	S30
10	On-line magnetite meter for sinter plant. Akio Yamamoto, et al. ....	S31
11	Development of sensors in sintering process. (Forecast system of sintering operation--I). Takehiko Sato, et al. ....	S32
12	Apply of sintering operation forecast model at No. 6 sintering machine. (Forecast system of the sintering operation--II). Tsutomu Sato, et al. ....	S33
13	Fluctuation analysis of bedding fine ore. Yoshifumi Matsunaga, et al. ....	S34
14	Main blower speed control for energy saving at Tobata No. 3 Sinter Plant, Nippon Steel Corp. Eiji Tominaga, et al. ....	S35

15	Influence of particle size and reactivity of fuels on the sintering. Takuma Kodama, et al. ....	S36
16	Theoretical investigation of sintering process and the effect of coke sizing. (Development of sintering operation forecasting system--I). Kimio Kato, et al. ....	S37
17	Effect of coke breeze particle size distribution on sintering heat pattern and sinter's quality. (Development to equalize the heat pattern in sintering bed--II). Hideo Hurutaku, et al. ....	S38
18	Relationship between sinter quality and heat pattern in sintering bed. Takahiro Nasuno, et al. ....	S39
19	Estimation of gas velocity distribution on the sinter strand by a model. Haruo Kokubu, et al. ....	S40
20	Measurement of suction pressure, temperature and gas generation in sintering process. Yosuke Sawada, et al. ....	S41
21	Analysis of sintering process by the mathematical model. Masatoshi Ichimiya, et al. ....	S42
22	Properties of petroleum coke-oil slurry. (Development of injection technique of petroleum coke-oil slurry into blast furnace--I). Mikio Deguchi, et al. ....	S43
23	Effect of concentration and size of coal, and temperature on viscosity of tar-coal mixture. (Viscosity of tar-coal mixture-I). Yoshihiro Hunabiki, et al. ....	S44
24	Time dependence on tar-coal mixture viscosity. (Viscosity of tar-coal mixture--II). Yoshihiro Funabiki, et al. ....	S45
25	Comparison between all coke and oil injection operation. (Study on the property of burden materials in blast furnace--II). Masatoshi Uchida, et al. ....	S46
26	Deadman condition at all coke operation. Takashi Miwa, et al. ....	S47
27	Progress of the low fuel rate test operation at Fukuyama No. 3 Blast Furnace, Nippon Kokan K.K. (The low fuel rate test operation at Fukuyama No. 3 Blast Furnace, Nippon Kokan K.K.--I). Sumiyuki Kishimoto, et al. ....	S48
28	The phenomenon in the furnace at the low fuel rate test operation. (The low fuel rate test operation at Fukuyama No. 3 Blast Furnace, Nippon Kokan K.K.--II). Kazumasa Wakimoto, et al. ....	S49

#### APRIL 2, 1982

29	Granulation and sintering of ore fines. (Study on combination of iron ore sinter feeds--I). Tasuku Takahashi, et al. ....	S50
30	Effect of heat pattern and silica addition on the quality of sinter products. (Study on combination of iron ore sinter feeds--II). Hidetaka Hayashi, et al. ....	S51
31	Mineral composition of sinter products of various iron ores. (Study on com- bination of iron ore sinter feeds--III). Hidetaka Hayashi, et al. ....	S52
32	Effect of CaO-Fe <sub>2</sub> O <sub>3</sub> layer as shell constituents of layered pellets. (Sintering process carried out with layered pellet feeds--I). Eiki Kasai, et al. ....	S53
33	Effect of serpentine granules as core constituents of layered pellets. (Sintering process carried out with layered pellet feeds--II). Eiki Kasai, et al. ....	S54
34	Properties of sinter ore added electric furnace slag. (Investigation of effects on sinter reaction of SiO <sub>2</sub> , Al <sub>2</sub> O <sub>3</sub> --IV). Junsuke Haruna, et al. ....	S55
35	Effects of CaO-containing additives on sintering activity. Chitoshi Shiotani, et al. ....	S56
36	Sinter production with low slag content. (Improvement of sinter quality--III). Osamu Kamotsu, et al. ....	S57
37	Study on the property of low slag sinter. (Improvement of sinter quality--IV). Kazuhiro Furukawa, et al. ....	S58
38	Establishment of uniform firing system in ignition furnace of sintering plant. Yosiaki Simakawa, et al. ....	S59
39	Pot tests by hot up-draft method from exhaust gas in sintering. Shigeo Itano, et al. ....	S60
40	Level Measuring system of torpedo car. Akio Yamamoto, et al. ....	S61
41	Development of turbine-style gas speedometer at the throat of blast furnace. (Development of measuring technique of gas velocity distribution at the throat of blast furnace--I). Mitutoshi Isobe, et al. ....	S62
42	Water model experiment of Divergent type nozzle. (Study of Tuyere--II). Hideto Watanabe, et al. ....	S63
43	Development of measurement apparatus for burden profile in blast furnace by a giant-pulse YAG laser. Takashi Nangai, et al. ....	S64
44	Development of high accuracy moisture gauge for blast furnace coke by utilizing C <sub>f-252</sub> neutrons and gammas. Hiro Amano, et al. ....	S65
45	Investigation on the extrusive mechanism of the wearing plate. Hiroshi Takamichi, et al. ....	S66
46	Experiment on the heating of the wall lining of the model of lower stack of blast furnace. (Investigation of ware mechanism of lining at lower stack of blast furnace--I). Yasujiro Koyama, et al. ....	S67

47	Application of thermal stress analysis to the lining design at lower stack of blast furnace. (Investigation of ware mechanism of lining at lower stack of blast furnace--II). Shoichi Ichiyama, et al. ....	S68
48	Development of mortar injection method during blast furnace operation. Masanobu Ogata, et al. ....	S69
49	Model test of refractories at hearth and bottom of blast furnace. Kunihiko Hironaka, et al. ....	S70
50	Mechanism of crack initiation at hearth of blast furnace. Akibumi Fujiwara, et al. ....	S71
51	Observation of deteriorated carbon brick in blast furnace by X-ray computed tomography. Ken-ichi Takimoto, et al. ....	S72
52	Carbon pick up from bituminous coal to molten iron. (Research on the smelting reduction of iron ore with coal--I). Kōji Kamiya, et al. ....	S73
53	Disolving rate of commercial reduced iron pellets and iron ore into molten iron. Akira Sato, et al. ....	S74
54	Basical test of coal gasification using small converter. (Development of molten iron coal gasification--I). Koji Okane, et al. ....	S75
55	Coal gasification test using 15 t pilot converter. (Development of molten iron coal gasification--II). Koji Okane, et al. ....	S76
56	Analysis of soluble silicon in metal drop by CMA. Hiroki Hamada, et al. ....	S77
57	Reduction of wustite containing both CaO and MgO, and magnetite containing both CaO and Al <sub>2</sub> O <sub>3</sub> . Yoshiaki Iguchi, et al. ....	S78
58	Acceleration effect of the small amount of sulphur in reducing gas on the reduction of wustite and the interaction with that of CaO. Shoji Hayashi, et al. ....	S79
59	The effect of H <sub>2</sub> gas reactions on the blast furnace operation. Takashi Sugiyama, et al. ....	S80
60	The effect of H <sub>2</sub> gas on the softening behavior in the blast furnace. Haruo Kokubu, et al. ....	S81
61	Oxygen potential of molten slag and pig iron at the hearth of blast furnace. Kazuhiro Nagata, et al. ....	S82
62	Role of slag film existing between trough material and molten metal in local corrosion. (Local corrosion of trough material at slag-metal interface--V). Jouki Yoshitomi, et al. ....	S83
63	Effects of some factors on local attack of runner materials by slag at slag-gas surface. Tatsuhiko Masuda, et al. ....	S84

#### APRIL 3, 1982

64	Analysis of the sintering process. (Study on the sinter qualities--I). Hidetoshi Noda, et al. ....	S85
65	Influence of mineral structure on sintered agglomerate's properties. (Mineral phase controlled sinter--I). Hiroshi Fukuyo, et al. ....	S86
66	Development of sinter structure measuring system. (Quantitative measurement of sinter structure--II). Katsuhiko Takemoto, et al. ....	S87
67	Investigation on reductivity of sintered ore with FeO less than 6%. Kiyoshi Kojima, et al. ....	S88
68	Microscopical investigation of reduction degradation of lime-fluxed sinter. Katsuhiko Inoue, et al. ....	S89
69	Analysis of high temperature properties of the sinter at Keihin Works, Nippon Kokan K.K. Kenji Torii, et al. ....	S90
70	Development of waste heat recovery system in sinter plant at Wakayama Steel Works, Sumitomo Metal Industries, Ltd. Tateo Kawasaki, et al. ....	S91
71	On the cooler waste heat recovery system of Kokura No. 3 Sinter Plant, Sumitomo Metal Industries, Ltd. Tatsunori Murai, et al. ....	S92
72	Studies on the operating conditions with the experimental heat recovery equipment. (Studies on the method of dry granulation and heat recovery of blast furnace slag--V). Tetsuyuki Nakamura, et al. ....	S93
73	Heat recovery of blast furnace slag. (Studies on the method of dry granulation and heat recovery of blast furnace slag--VI). Yoshimatu Suzuki, et al. ....	S94
74	Properties of the slag after heat recovery. (Studies on the method of dry granulation and heat recovery of blast furnace slag--VII). Tetsuyuki Nakamura, et al. ....	S95
75	Analysis of breakage of coke in drum test. Hidetake Suginohe, et al. ....	S96
76	Examination of the estimating system for coke strength using petrographic data on semi-coke structure. Tatsuo Fukuyama, et al. ....	S97
77	Studies on programmed heating of coke oven. Nobuo Suzuki, et al. ....	S98
78	An estimation method of the CSR of coke from coal blends. Yoshihisa Sakurai, et al. ....	S99
79	Automatic charging buggy system of Muroran No. 6 Battery, Nippon Steel Corp. Masaki Fukunaga, et al. ....	S100
80	Experimental study on the quality of formed coke contained in coke breeze. Katutoshi Igawa, et al. ....	S101
81	Indirect preheating of circulating gas in formed coke process. (New develop-	

	ment of formed coke process by two-stage heating--VIII).	
	Toshiaki Okuhara, et al. ....	S102
82	Influence of coal blending conditions on the strength after CO <sub>2</sub> gasification of formed coke. (New development of formed coke process by two-stage heating--IX). Katsuaki Kobayashi, et al. ....	S103
83	Influential factors on the repose angle of burden materials. Ken-ichi Okimoto, et al. ....	S104
84	Observation of burden distribution in blast furnace practice. (Studies of the mechanisms of burden distribution in the blast furnace--I). Ken-ichi Asai, et al. ....	S105
85	Effect of gas flow and burden descent on radial burden distribution. Michiru Nakagome, et al. ....	S106
86	Relation between in-furnace information obtained by vertical probes and operational conditions of blast furnace. (Investigation of behavior in blast furnace by vertical probe--II). Toshiyuki Irita, et al. ....	S107
87	Analysis of blast furnace operation by use of gas pressure loss measurement. Akiyoshi Kometani, et al. ....	S108
88	Simultaneous analysis of gas flow and heat transfer in blast furnace by finite element method. Jun-ichiro Yagi, et al. ....	S109
89	Dependence of rate-determinant factors of silicon transfer in the blast furnace on the operating conditions. Seiji Taguchi, et al. ....	S110
90	Simulation of the drainage of two liquids from a blast furnace hearth. J. M. Burgess, et al. ....	S111
91	Melting zone in blast furnace by pseudo-hot model. Yotaro Ohno, et al. ....	S112
92	Heat control system at Wakayama No. 3 B.F., Sumitomo Metal Industries, Ltd. Koichi Otsuka, et al. ....	S113
93	Development of analytical system of blast furnace operation data. Koichi Kimura, et al. ....	S114
94	Development of mathematical simulation model of iron making section. Hideyuki Yamaoka, et al. ....	S115
95	Development of monit ring system for the circumferential distribution in the blast furnace. Chisato Yamagata, et al. ....	S116
96	System for blast furnace top-gas measurement in the circumferential direction applying mass spectrometer. Makoto Nomura, et al. ....	S117
97	Measurement of blast furnace top-gas in the circumferential direction by mass spectrometer. Makoto Nomura, et al. ....	S118
98	Properties of sinter sampled from the blast furnace shaft during shut-down. (Study on the property of burden materials in the shaft of blast furnace --II). Tamio Noda, et al. ....	S119
99	The diametric distribution of O/C and the profile of softening melting zone. (Report on dissection No. 1 Blast Furnace (Second), Nagoya Works, Nippon Steel Corp. Tamio Noda, et al. ....	S120
100	Investigation on lining of blown-out Muroran No. 3 Blast Furnace, Nippon Steel Corp. Kazuteru Aoyama, et al. ....	S121
101	Behaviour of alkalis in the blast furnace shaft. Shunsuke Arino, et al. ....	S122
102	Properties of coke sampled at tuyere level. Kuniyoshi Anan, et al. ....	S123
103	Impacts on coke particles in the raceway. (Investigation of Raceway--III). Michiru Nakagome, et al. ....	S124

-- STEELMAKING --

APRIL 1, 1982

104	Analysis of fluid flow and gas-liquid mass transfer in gas-stirred reactors. Nagayasu Bessho, et al. ....	S125
105	Water model experiment on the gas-liquid interfacial area in gas-mixed tank. (Research on the smelting reduction of iron ore with coal--II). Akira Fukuzawa, et al. ....	S126
106	A model study of slag-metal reaction. Masahiro Hirasawa, et al. ....	S127
107	Development of gaseous oxygen injection method for desiliconization by dipped lance. (Developments of hot metal-dephosphorization and its application technique--I). Takashi Inoue, et al. ....	S128
108	Metallurgical characteristics of desiliconization treatment by gaseous oxygen injection method. (Developments of hot metal dephosphorization and its application technique--II). Yuji Kawachi, et al. ....	S129
109	Basic experiments of injection apparatus. Hiroyuki Ikemiya, et al. ....	S130
110	Desiliconization of hot metal with iron oxide flux. Hiromitsu Ueki, et al. ....	S131
111	Development of continuous desiliconization treatment of hot metal in iron runner. Ryuichi Hori, et al. ....	S132
112	Development of continuous desiliconization process of molten pig iron. Makoto Nakamura, et al. ....	S133
113	Full automatic casting control system at Chiba No.3 C.C., Kawasaki Steel	

Corp. Wataru Fukuhara, et al. ....	S134
114 Machine condition diagnosis techniques of continuous caster by process computer control. Katsumi Nakamura, et al. ....	S135
115 Automatic system for starting operation in continuous caster. Kazuaki Miyahara, et al. ....	S136
116 A new electrode-type level meter for continuous casting machines. Yoshitaka Nimura, et al. ....	S137
117 Effect of mold level fractuaton on surface quality. (Development of casting condition observation system at continuous casting--I). Taizo Sera, et al. ....	S138
118 On metal solidification and heat transfer in mold at high speed casting. (Study on heat transfer and solidification in continuous casting mold--I). Yutaka Nagano, et al. ....	S139
119 Derivation of a formula for mold temperature calculation based on heat transfer analysis. (Study on heat transfer and solidification in continuous casting mold--II). Shigeyuki Maeno, et al. ....	S140
120 Development of the heat flow meter for continuous casting mould. Hiromitsu Yamanaka, et al. ....	S141
121 Thermal analysis of a pinch roll for a continuous casting machine. Osamu Kato, et al. ....	S142
122 Study of sleeve-type rolls for C.C.M. Tokio Yamamoto, et al. ....	S143
123 Vibration analysis of the roll bearing with flaw of C.C.M. (Study on the diagnosis of a low rotary machine--V). Shigeru Izawa, et al. ....	S144
124 Mechanical vibration and noise analysis in a continuous casting machine. (Study on the diagnosis of a low rotary machine--VI). Takashi Mitsuihiro, et al. ....	S145
125 A mathematical model of C.C. mold oscillator. (A new method for predicting surface defects of C.C. slabs--I). Yoichi Fujikake, et al. ....	S146
126 Development of a system for measuring friction in C.C. mold. (A new method for predicting surface defects of C.C. slabs--II). Yukio Nakamori, et al. ....	S147
127 Development of a method to detect surface defects of C.C. slabs by analyzing the on-line data of mould oscillation. (A new method for predicting surface defects of C.C. slabs--III). Kenji Tokiwa, et al. ....	S148
128 Review of mould friction measurements. Manfred Wolf, et al. ....	S149
129 Development of mould wall/slab ultrasonic contact meter. Seita Terao, et al. ....	S150
130 Measurement of gap between solidifying shell and mould wall in C.C. Takashi Mori, et al. ....	S151
131 Melting behavior of mould powders for continuous casting. Tadao Watanabe, et al. ....	S152
132 Knowledges on glass forming property of mould powder in strand casting. Kenichi Sorimachi, et al. ....	S153
133 Detection of the thickness of molten slag layer of mould powder by the method of electric conductivity measurement. Hiromitsu Yamanaka, et al. ....	S154
134 Investigation on characteristics of flow rate from immersion nozzle in continuous casting by water modelling. Toshimitsu Taira, et al. ....	S155
135 Effects of jet stream from immersion nozzle on formation of pin hole slab surface caused by H in the molten steel. Hiromitsu Yamanaka, et al. ....	S156
136 Improvement of surface quality of C.C.-bloom. Yoshinori Onoe, et al. ....	S157
137 Study on the generation of longitudinal cracks in continuous caster's secondary cooling zone. (Studies on the decreasing of facial defects of the continuously cast slab--VII). Hiroaki Yamamoto, et al. ....	S158
138 Study on the improvement of surface quality on continuously cast slabs by controlling solidification mold. (Studies on the decreasing of facial defects of the continuously cast slab--VIII). Syunichi Tanaka, et al. ....	S159
139 Study on the improvement of surface quality in continuously cast slabs by meniscus level controlling in mold. Takashi Uchida, et al. ....	S160
140 The mechanism and prevention method of the surface transverse cracking at the narrow face of the C.C. slab. Jun-ichi Fukumi, et al. ....	S161
141 Performance of rolling the continuously cast slab free from surface conditioning in stainless steel. (Influence of the OSM depth on OSM pattern or OSM crack--II). Keiji Yasuzawa, et al. ....	S162
142 Actual condition and mechanism of formation of segregation along oscillation marks on austenitic stainless steel. Shogo Matsumura, et al. ....	S163
143 Quick detection of longitudinal facial cracks on continuously cast hot slabs. (Automatic detection of surface defects on continuously cast hot slabs--II). Mitsuaki Uesugi, et al. ....	S164
144 Detection of corner cracks on continuously cast hot slabs. (Automatic detection of surface defects on continuously cast hot slabs--III). Mitsuaki Uesugi, et al. ....	S165
145 Defect detecting power of hot slab surface inspection equipments by induction heating technique. Yoshio Ide, et al. ....	S166

146	Infiltration of molten FeO-SiO <sub>2</sub> slag into high alumina bricks. Seiji Yokoyama, et al. ....	S167
147	Corrosion resistance of refractories for Na <sub>2</sub> CO <sub>3</sub> -SiO <sub>2</sub> melts. Hiroo Kobayashi. ....	S168
148	Corrosion of refractories by molten Na <sub>2</sub> CO <sub>3</sub> slag. Toshiaki Fukuda, et al. ...	S169
149	Role of silicon carbide in Al <sub>2</sub> O <sub>3</sub> -SiC-C refractories. Tatsuhito Takahashi, et al. ....	S170
150	Development of refractories for BOF. Haruya Nagai, et al. ....	S171
151	Prevention of lining erosion by cooling BOF vessel. (Development of vessel cooling system--I). Eiji Ikezaki, et al. ....	S172
152	Development of automatic gunning equipment and gunning materials for BOF. (Automatic gunning system for BOF--I). Masakazu Ikeda, et al. ....	S173
153	Development of equipment for monitoring BOF lining. (Automatic gunning system for BOF--II). Masakazu Ikeda, et al. ....	S174
154	Test trials of flame gunning for repairing LD converter linings. Teruyoshi Murahashi, et al. ....	S175
155	Installation of 300 t steel ladle lined by casting method. Kohei Shimada, et al. ....	S176
156	Basic castable materials for ladle refractory. Kazuki Ogasahara, et al. ....	S177
157	Evaluation of the thermal shock resistance of basic brick. Tsuneo Kayama, et al. ....	S178
158	Wear mechanism of basic refractories for LRF. Seiji Tanaka, et al. ....	S179
159	Some improvements of refractory for RH-degasser. Akira Harita, et al. ....	S180
160	Study of wear of upper chamber lining of RH vessel. Masafumi Ikeda, et al. ....	S181
161	Development of refractory casting method for tundish lining. Takashi Masuda, et al. ....	S182
162	Improvement of refractories for continuous casting of stainless steel. Naoki Shigematsu, et al. ....	S183
163	Absorption rate of nitrogen injected into molten iron.--Effect of sulfur contained in iron. Korehito Kadoguchi, et al. ....	S184
164	Denitritization of molten steel by gas injection. (Development of producing ultra low N steel--I). Yoshiteru Kikuchi, et al. ....	S185
165	Production of ultra low carbon steel by RH process. Tetsuya Fujii, et al. ....	S186
166	Degassing of molten steel by gas injection. Akira Notoh, et al. ....	S187
167	New and modified melting facilities at No.1 steel making shop of Chiba Works of Kawasaki Steel Corp. Kunihiko Ishizaka, et al. ....	S188
168	Blowing control of BOF with microwave slag level determinater (MSD-method). (Measurement of the slag foaming level in BOF--III). Kiyoshi Ichihara, et al. ....	S189
169	An equipment for measuring the temperature and sampling of molten steel during tapping. Hitoshi Morishita, et al. ....	S190
170	The behavior of hydrogen during the slagless refining process. Masayasu Kimura, et al. ....	S191
171	Development of slag-minimum-process combined blowing. (Investigation of STB process--VI). Hidemasa Nakajima, et al. ....	S192
172	An investigation on slag-less blowing in Q-BOP. Hitoshi Morishita, et al. ..	S193
173	Production of stainless steels by combined blowing process at Chiba Works of Kawasaki Steel Corp. Masaru Shibata, et al. ....	S194
174	Utilization of coke in LD converter with small slag ratio for making middle and high carbon steel. Jun-ichiro Katsuda, et al. ....	S195
175	Bubbling-jetting phenomena in powder injection into liquid. Yasuhisa Ozawa, et al. ....	S196
176	Water model experiments on fluid flow in liquid steel bath and vibrations of the top- and bottom-blowing converter. Ken-ichiro Suzuki, et al. ....	S197
177	Water model experiments on two-dimensional velocity distributions of liquid steel near the bottom of top- and bottom-blowing converter. Michio Tanaka, et al. ....	S198
178	Metallurgical characteristics of LD-OB process at Ohita Works, Nippon Steel Corp. (Development of LD-OB process--I). Nozomi Matsumoto, et al. ...	S199
179	Improvement of dephosphorizing at high carbon range in basic oxygen furnace by top and bottom blowing system. Youichi Nimura, et al. ....	S200
180	Dephosphorization of high carbon steel by flux in the top and bottom blowing converter. Zinsuke Takata, et al. ....	S201
181	The experimental results of 2.5 ton and 15 ton converters. (Development of top and bottom blowing process with lime-powder injection from top lance in BOF--I). Seiichi Masuda, et al. ....	S202
182	Operation results of 160 ton converter. (Development of top and bottom blowing process with lime-powder injection from top lance in BOF--II). Kouji Ieda, et al. ....	S203
183	Effect of lime injection from top lance on blowing behaviour in BOF. Rinzo Tachibana, et al. ....	S204
184	Effect of burnt lime injection with oxygen lancing on combination blowing.	



	Keizo Taoka, et al. ....	S205
185	The judgement of blow-down [C] by oxygen probe in VOD operation. Hideaki Tenma, et al. ....	S206
186	Development of oxygen probe for low oxygen activity measurement. Hajime Nakamura, et al. ....	S207

APRIL 2, 1982

187	Embrittlement due to phosphorus at elevated temperature in carbon steel. --Improvement of C.C. slab quality--. H.G. Suzuki, et al. ....	S208
188	Engineering and operation of the CC-DR process. Seio Hachiya, et al. ....	S209
189	Production method of continuous casting slab without internal and surface defect. (Production process of no defective slab with high temperature for CC-DR). Akira Takeda, et al. ....	S210
190	Development of production control system for CC-DR. Hiroshi Shiino, et al. ....	S211
191	Process computer system for CC-DR process. Zenji Kajita, et al. ....	S212
192	Operation with constant speed and sequence casting ratio. (New process for direct connection of steelmaking plant to rolling mills--I). Toshiaki Komiya, et al. ....	S213
193	Technique of high temperature-non defect slab production. (New process for direct connection of steelmaking plant to rolling mills--II). Hideyuki Takahama, et al. ....	S214
194	Development of dynamic production control system for direct-linked steelmaking-rolling process. (New process for direct connection of steelmaking plant to rolling mills--III). Toshiaki, Nakashima, et al. ....	S215
195	The construction and operation of new slab and bloomcaster at Wakayama Works, Sumitomo Metal Ind. Kozaburo Ozaki, et al. ....	S216
196	The new method to evaluate a central segregation of C.C. slab for low S and Ca additional steel.--Segregation etch print method--. Shinya Kitamura, et al. ....	S217
197	A macro analyzer analysis of distribution and corresponding structures of S, P and Mn segregation on the slab and the plate. Hiroyuki Ogawa, et al. ....	S218
198	Semi-macro segregation in continuously cast slab. Yutaka Tsuchida, et al. ..	S219
199	Outline of No.2 continuous casting in Nagoya Works, Nippon Steel Corp. (Development of direct pouring system in continuous casting--I). Takuzo Hatakeyama, et al. ....	S220
200	Improvement of technology about the production of the slab free from surface conditioning. (Development of direct pouring system in continuous casting--II). Jun Oshida, et al. ....	S221
201	Study of improving on the internal quality of slab. (Development of direct pouring system in continuous casting--III). Yoshimasa Mizukami, et al. ....	S222
202	Automatic mold level control systems for continuous casting. (Development of direct pouring system in continuous casting--IV). Shunichi Yamazaki, et al. ....	S223
203	Study on the removal of nonmetallic inclusions in tundish by absorbent method. Junji Abu, et al. ....	S224
204	Influence of operational techniques on the non-metallic inclusion of continuously cast bloom. Takanori Kominami, et al. ....	S225
205	Phenomenon of alumina deposit in tundish nozzle. Yasutsugu Ogura, et al. ...	S226
206	Effect of vertical zone length and casting speed on inclusions in C.C. slab. Toshio Teshima, et al. ....	S227
207	Deformation of inclusion during width reduction with sizing mill. Shigenori Tanaka, et al. ....	S228
208	Behavior of micro-segregation spot during thickness reduction with sizing mill. Shigenori Tanaka, et al. ....	S229
209	Operation of reduction-furnace used arc-furnace dust. Kazuo Sasaki, et al. ....	S230
210	Experimental results on scrap preheating. Yasuo Saito, et al. ....	S231
211	Self-heating behaviors during re-oxidation of reduced iron. Masayoshi Fukuoka, et al. ....	S232
212	On the thermal conductivity of sponge iron. P.K. Rademacher, et al. ....	S233
213	On the melting of scrap and sponge iron. P.K. Rademacher, et al. ....	S234
214	Study on a smelting process of directly reduced iron pellet. Ryuji Yamaguchi, et al. ....	S235
215	Heat transfer study on a smelting process of directly reduced iron pellets. Ryuji Yamaguchi, et al. ....	S236
216	Construction of the blast granulation plant of BOF slag at Fukuyama Works, NKK. (Study on air granulating system of LD slag--IV). Shinya Kinoshita, et al. ....	S237
217	Rapid aging treatment of steel slag. Yoshikazu Nagao, et al. ....	S238
218	The application of LD slag for road base material. Michio Konno, et al. ....	S239
219	Improvement of soil property with LD converter slag. Miyosi Usikubo, et al. ....	S240

220	Fundamental study on soda ash recovery. (Soda ash recovery from soda slag--I). Tatsuo Katoh, et al. ....	S241
221	Operation result in soda ash recovery pilot plant. (Soda ash recovery from soda slag--II). Yoshitaka Fukai, et al. ....	S242
222	On the operation results and the improvements by each process in soda ash recovery plant. (Development of soda ash recovery from the desulfurization slag--III). Takao Hashimoto, et al. ....	S243

APRIL 3, 1982

223	On the desulfurization of steel by flux containing CaAl. (Flux steel refining--III). Norio Hirokawa, et al. ....	S244
224	Desulfurization by CaO-based flux injection from top lance under reduced pressure. Kaoru Shinme, et al. ....	S245
225	Production of low phosphorus steel in BOF-VAD process. Motoji Tarui, et al. ....	S246
226	Production of clean steel by EAF-LRF-vacuum casting (Ar blowing) process. (Study on ladle refining technics--II). Kazuo Kitamura, et al. ....	S247
227	The behavior of oxide inclusions of high carbon steel in EF-LF-CC process. Shusaku Nozaki, et al. ....	S248
228	Shape control of non-metallic inclusions in austenitic stainless steel sheet. Tsukasa Suzuki, et al. ....	S249
229	Control of inclusion in high carbon steel cord for tyre by flux treatment. Yutaka Shinjyo, et al. ....	S250
230	ESR slag for steel and superalloy containing titanium and aluminium. (Research on electros slag remelting of superalloy--I). Teruo Ishii, et al. ..	S251
231	Production of special steel for a small lot by converter-ladle furnace process. Kazuyuki Yamada, et al. ....	S252
232	Production of Pb free-cutting steel by injection method. Hiroyuki Matsuyama, et al. ....	S253
233	The characteristics of rotary motor type electromagnetic stirrer and the effect of fluid flow on the solidification phenomena. (Application of electromagnetic stirring to continuous casting--IV). Hideaki Mizukami, et al. ....	S254
234	Electromagnetic stirring at the final stage of solidification by rotary type stirrer. (Application of electromagnetic stirring to continuous casting--V). Hideaki Mizukami, et al. ....	S255
235	Application of a conduction current multi-stage electro-magnetic stirring to continuous cast slabs. Ken-ichi Tada, et al. ....	S256
236	The effects of electromagnetic stirring on properties of continuously cast high carbon steel slabs. Hiroaki Shinagawa, et al. ....	S257
237	Application of a multi-stage electro-magnetic stirring to a big section bloom caster. Yuji Tanaka, et al. ....	S258
238	Production test results of high carbon chromium steel by continuous caster. (The technique of electro-magnetic stirring of C.C. bloom--XII). Yasuhiko Ohta, et al. ....	S259
239	On the solidification model for strand under fluid flow by electromagnetic stirrer. (Study on effect of electromagnetic stirring on the formation of equi-axis zone--III). Shun-ichi Tanaka, et al. ....	S260
240	Effect of electro magnetic stirrer on the quality of continuously cast slab. (Application of EMS to continuous casting--I). Toshiaki Ishida, et al. ....	S261
241	Removal of non-metallic inclusions by EMS in the secondary cooling zone of C.C. machine. Hideyuki Misumi, et al. ....	S262
242	Effect of in-mould electromagnetic stirring on centre segregation of continuously cast high carbon steel. (Application of electromagnetic stirring method--I). Mitsuo Tomonaga, et al. ....	S263
243	Effect of combined electromagnetic stirring on centre segregation of continuously cast high carbon steel. (Application of electromagnetic stirring method--II). Mitsuo Tomonaga, et al. ....	S264
244	Characteristics of electro-magnetic stirring force in mold. Shinji Shibao, et al. ....	S265
245	Fused metal model experiment and analysis on the electromagnetically driven flow in the mold. Eiichi Takeuchi, et al. ....	S266
246	Development of the continuous casting mold installed electromagnetic stirrer. Hiromu Fujii, et al. ....	S267
247	Effect of stirring and chemical composition on the blow hole formation during solidification of pseudo-rimmed steel. (Basic research on continuous casting of pseudo-rimmed steel--I). Toru Kitagawa, et al. ....	S268
248	Analytical model on the blow hole formation during solidification of pseudo-rimmed steel. (Basic research on continuous casting of pseudo-rimmed steel--II). Toru Kitagawa, et al. ....	S269
249	Application of mould electro magnetic brake on continuous casting. Shoichi Hiwasa, et al. ....	S270

250	Computer calculations on solidification in welding process by ESR. Hideyo Kodama, et al. ....	S271
251	Solidification analysis for mould shape and teeming temperature of high carbon alloy steel ingot. Minoru Yao, et al. ....	S272
252	Mechanism of $\delta$ - $\gamma$ transformation for determining the solidification range of carbon steel ingots. Ken-ichi Ohsasa, et al. ....	S273
253	Formation of dendritic inclusion during the solidification of Fe-Si-O alloys. Rokuro Sakagami. ....	S274
254	Quantitative study on the carbon segregation of steel ingot. Takashi Sakurai, et al. ....	S275
255	On the segregation reduction of the forging ingot. Masayoshi Okamura, et al. ....	S276
256	Development of pouring method making different weight ingots with one trumpet. Akihiko Nanba, et al. ....	S277
257	Horizontal continuous casting pilot plant for steel billet. (Development of horizontal continuous caster--II). Jun Miyazaki, et al. ....	S278
258	Mold lubrication in horizontal continuous casting. (Development of horizontal continuous caster--III). Hiroyuki Yasunaka, et al. ....	S279
259	Quality improvement of horizontal continuous casting steel by electromagnetic stirring in the mold. (Development of horizontal continuous caster--IV). Kenzo Ayata, et al. ....	S280
260	Solidification structure of stainless steel billet by horizontal continuous casting. Ken Nakai, et al. ....	S281
261	Expansion of the applicable steel grade in horizontal continuous casting process. Masahiro Tsuru, et al. ....	S282
262	Continuous casting of round bloom for seamless tube. Junichi Hasunuma, et al. ....	S283
263	Activity of sulfur in solid Fe-Cr alloy. Yoshimoto Wanibe, et al. ....	S284
264	Determination of liquidus in CaO-Al <sub>2</sub> O <sub>3</sub> -CaS ternary system. Shigeru Inoue, et al. ....	S285
265	Absorption of sulfur by liquid slags from the gas phase. Chiyoshige Yamamoto, et al. ....	S286
266	Activity measurements of Na <sub>2</sub> O-SiO <sub>2</sub> system by sodium $\beta$ -Al <sub>2</sub> O <sub>3</sub> . Shu Yamaguchi, et al. ....	S287
267	Activity measurements of P <sub>2</sub> O <sub>5</sub> on Na <sub>2</sub> -P <sub>2</sub> O <sub>5</sub> system by vapor pressure method. Shu Yamaguchi, et al. ....	S288
268	Thermodynamics of Fe-O-P <sub>2</sub> O <sub>5</sub> -Na <sub>2</sub> O in equilibrium with solid iron. Mitsutaka Hino, et al. ....	S289
269	Dephosphorization of molten Fe-Mn-C alloys. Masafumi Maeda, et al. ....	S290
270	Effect of treating conditions on dephosphorization of molten pig iron containing chromium by Li <sub>2</sub> CO <sub>3</sub> -bearing flux. Takashi Yamauchi, et al. ....	S291
271	Dephosphorization of crude stainless steel. Tohru Matsuo, et al. ....	S292
272	Equilibrium distribution of phosphorus between metal and slags containing CaO at hot metal temperatures. Kimihisa Ito, et al. ....	S293
273	Effect of CaF <sub>2</sub> addition on dephosphorizing power of CaO-based slags for hot metal pretreatment. Hideo Nakamura, et al. ....	S294
274	Development of hot metal-dephosphorization by CaO-FeO-CaF <sub>2</sub> flux. (Developments of hot metal-dephosphorization and its application technique--III). Minoru Naki, et al. ....	S295
275	Refining process for stainless steel and high carbon steel by dephosphorization of hot metal. (Developments of hot metal- dephosphorization and its application technique--IV). Noriyuki Masumitsu, et al. ....	S296
276	Dephosphorization and desulfurization of hot metal with CaO-based flux. Kaoru Shinme, et al. ....	S297
277	Result of hot metal dephosphorization by injection equipment. (Development of hot metal pretreatment technique by CaO-based flux--I). Hideo Nakamura, et al. ....	S298
278	Experimental results of 250 ton hot metal dephosphorization. (Development of hot metal pretreatment technique by CaO-based flux--II). Akira Ishizaka, et al. ....	S299
279	Construction and operation of desulphurizing facilities in ladle. Yuuzi Takaki, et al. ....	S300
280	The result of industrial scale dephosphorizing and desulphurizing of hot metal. (Development of a process for dephosphorizing and desulphurizing hot metal by CaO-base flux--V). Shigeaki Tonomura, et al. ....	S301
281	Effects of powder injection on dephosphorization and desulphurization of hot metal. (Development of a process for dephosphorizing and desulphurizing hot metal by CaO-base flux--VI). Kazushige Umezawa, et al. ....	S302
282	Analysis of "sloshing" caused by gas injection into water bath. (Development of a process for dephosphorizing and desulphurizing hot metal CaO-base flux--VII). Yasuyuki Nakao, et al. ....	S303

-- ANALYSES --

APRIL 1, 1982

283	A study on the determination of iron samples with higher oxygen content. Mitsuru Ueda, et al. ....	S304
284	Flow injection analysis of Fe(II) and Fe(III) in solution by using coulometric detector. Fumiaki Kikui, et al. ....	S305
285	Method for determination of molybdenum and tungsten in iron by atomic absorption analysis. Eiji Ichise, et al. ....	S306
286	Influence of H <sub>2</sub> O and FeO(II) in X-ray fluorescence analysis of iron ores. Yoshiro Matsumoto, et al. ....	S307
287	Effect of microstructure on the emission spectrometric analysis of carbon in steels. Yosimasa Turuoka, et al. ....	S308
288	Optimization studies for measurements in inductively-coupled plasma atomic emission spectroscopy. Akihiro Goda, et al. ....	S309
289	Effect of atmospheric gases in induction coupled plasma atomic emission spectroscopy. (Determination of trace amounts of P and B in steels). Teruo Yokooji, et al. ....	S310
290	Determination of trace amount of boron in steel by inductively coupled plasma atomic emission spectrometry. Noritaka Sakao, et al. ....	S311
291	Development of automatic pretreatment equipments for process analysis. Yasuji Tanaka, et al. ....	S312
292	Personal computer aided for process analysis data processing system. Yuzi Okuyama, et al. ....	S313
293	Microcomputer control of ion microprobe mass analyser. Toshiko Suzuki, et al. ....	S314
294	Precipitation behavior of phosphides in the centerline segregation zone of slabs. Fumio Kurosawa, et al. ....	S315
295	A new technique of controlled-potential electrolytic method for the secondary separation of non-metallic inclusion extracted from steel. Yoshiko Funahashi, et al. ....	S316
296	Size separation of fine precipitates in steel by ultrasonic filtration method. Takamasa Takahashi, et al. ....	S317
297	Chemical state analysis of sulfur in steel by hydrogen hot extraction Method. (Phase analysis of non-metallic elements in steel by hydrogen hot extraction--I). Takeshi Furukawa, et al. ....	S318
298	Quantitative phase analysis of textured materials by X-ray diffraction. Masayuki Okamoto, et al. ....	S319
299	Fundamental characteristics of electron probe large area mapping analyzer. Koichi Kitamura, et al. ....	S320
300	Quantitative analysis of adhered elements on steel sheets by glow discharge spectroscopy. Yoshiharu Ohashi, et al. ....	S321
301	Surface analysis by glow discharge spectrometry. Isamu Tanaka, et al. ....	S322
302	Determination of trace amounts of C, P and S in steel by glow discharge spectrometry. Isamu Tanaka, et al. ....	S323