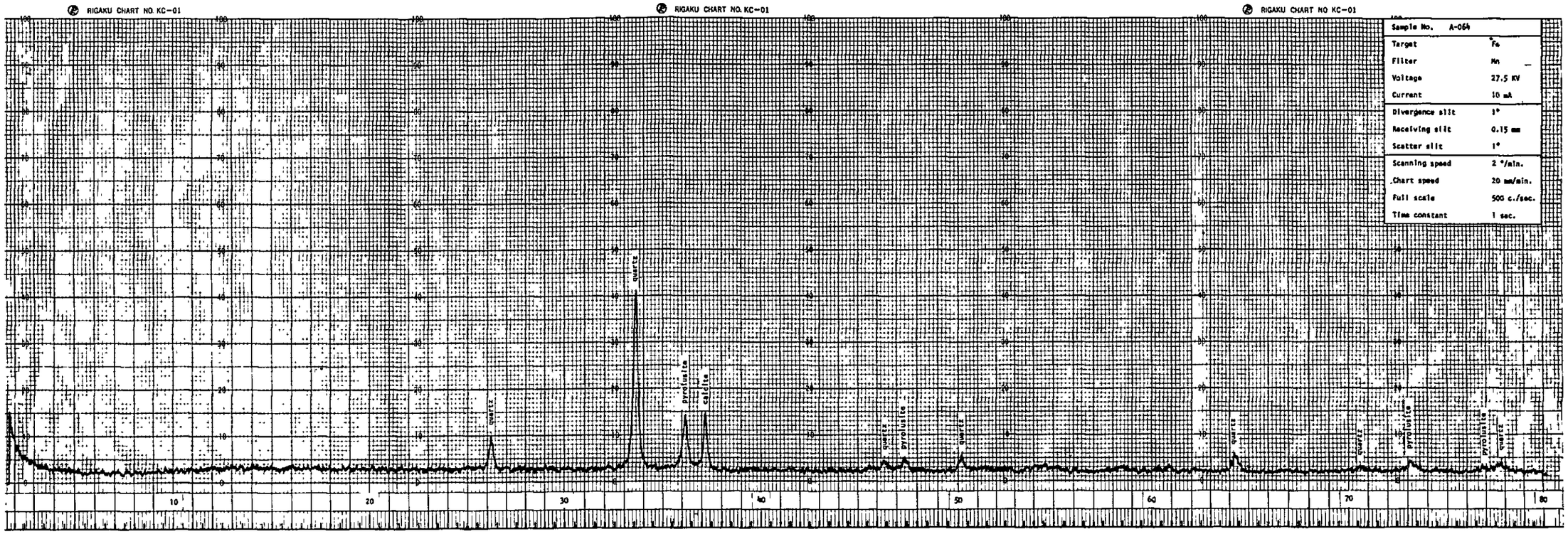
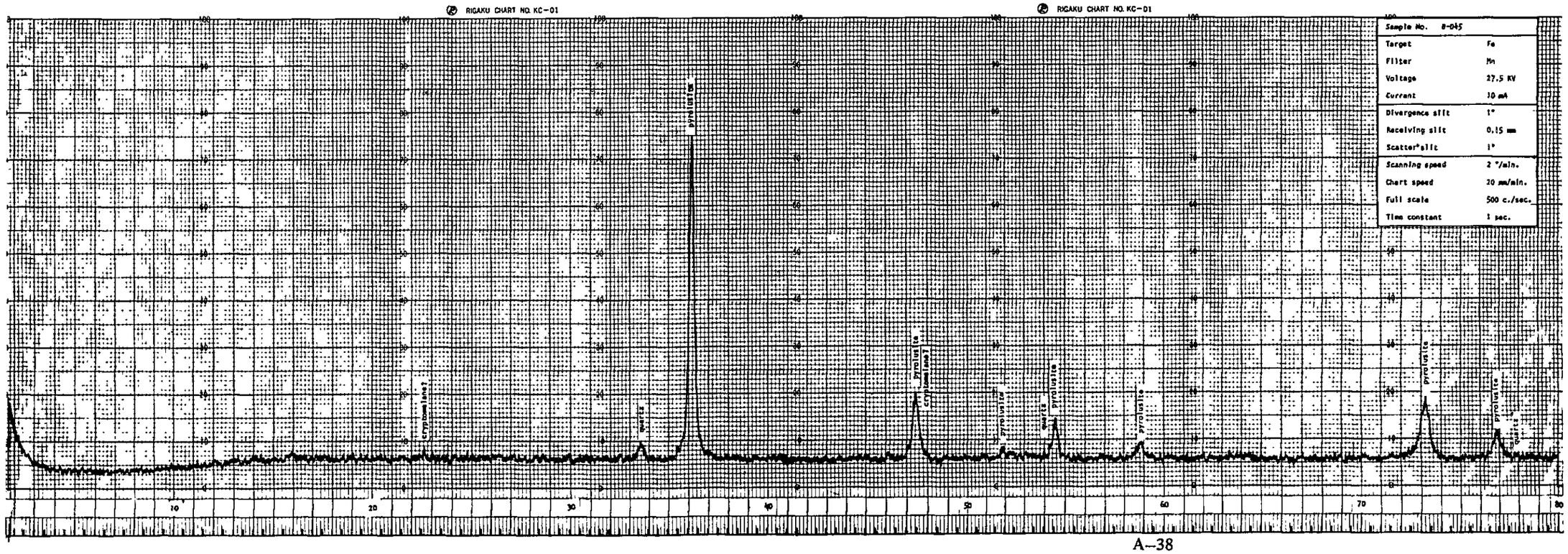
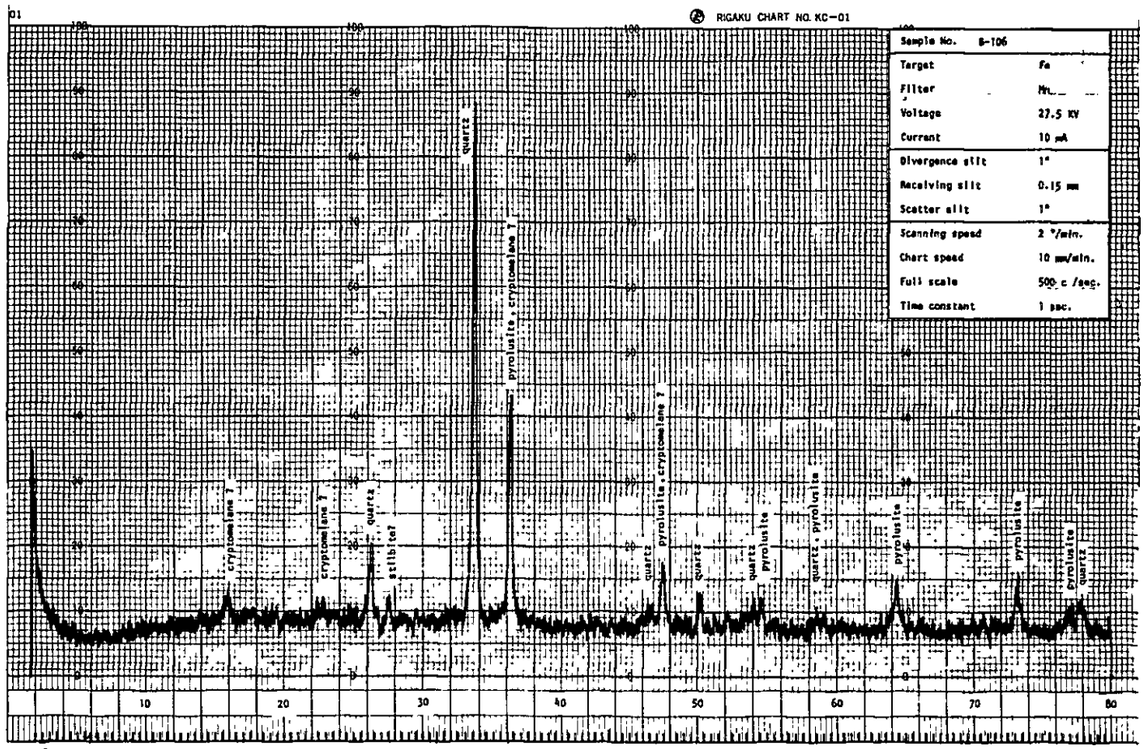
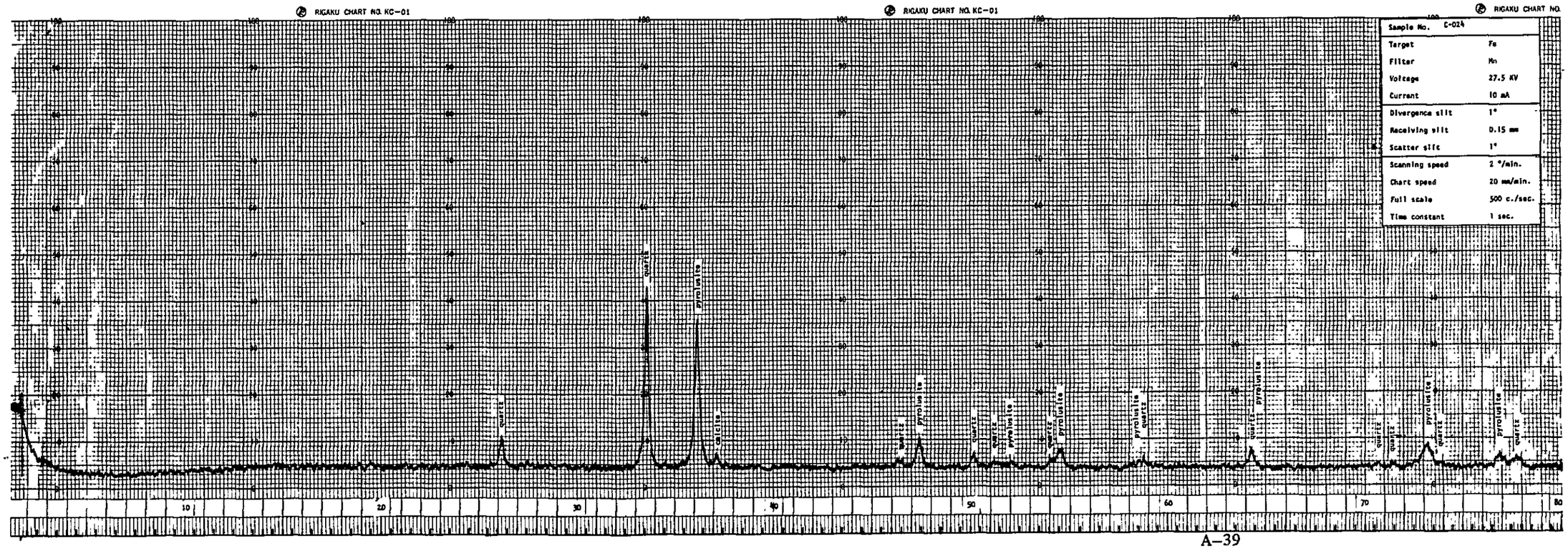
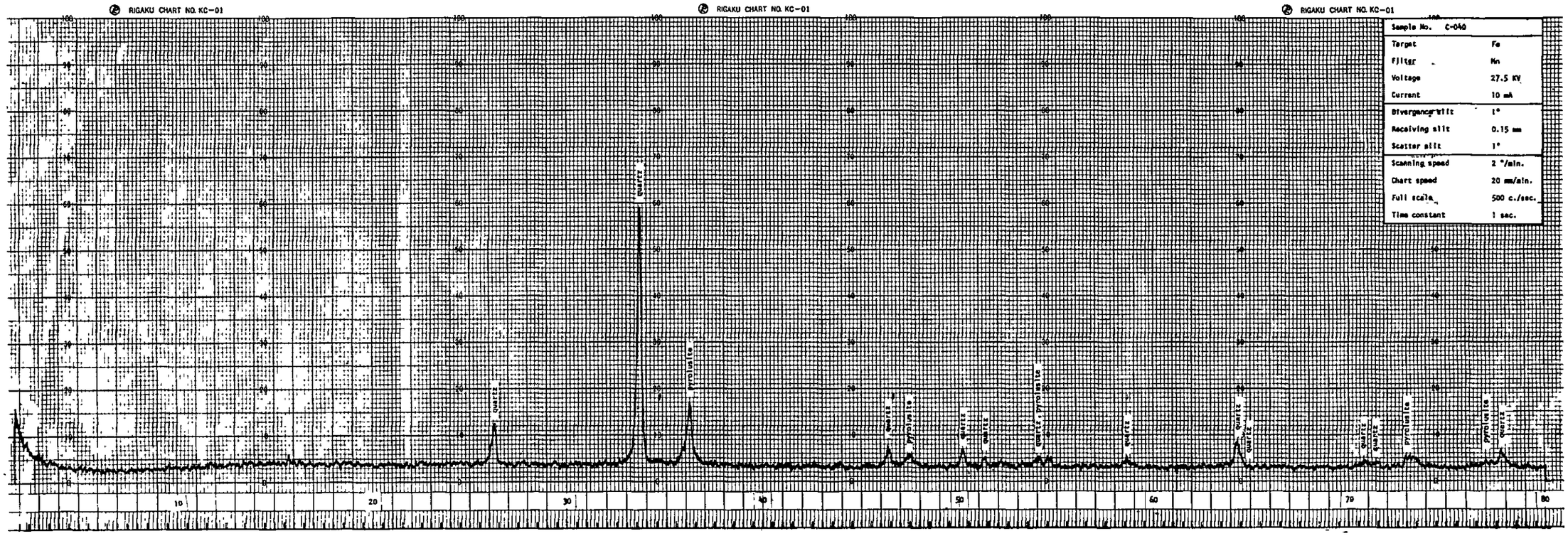
Fig. A-5 Chart of X-ray Powder Diffractive Analysis

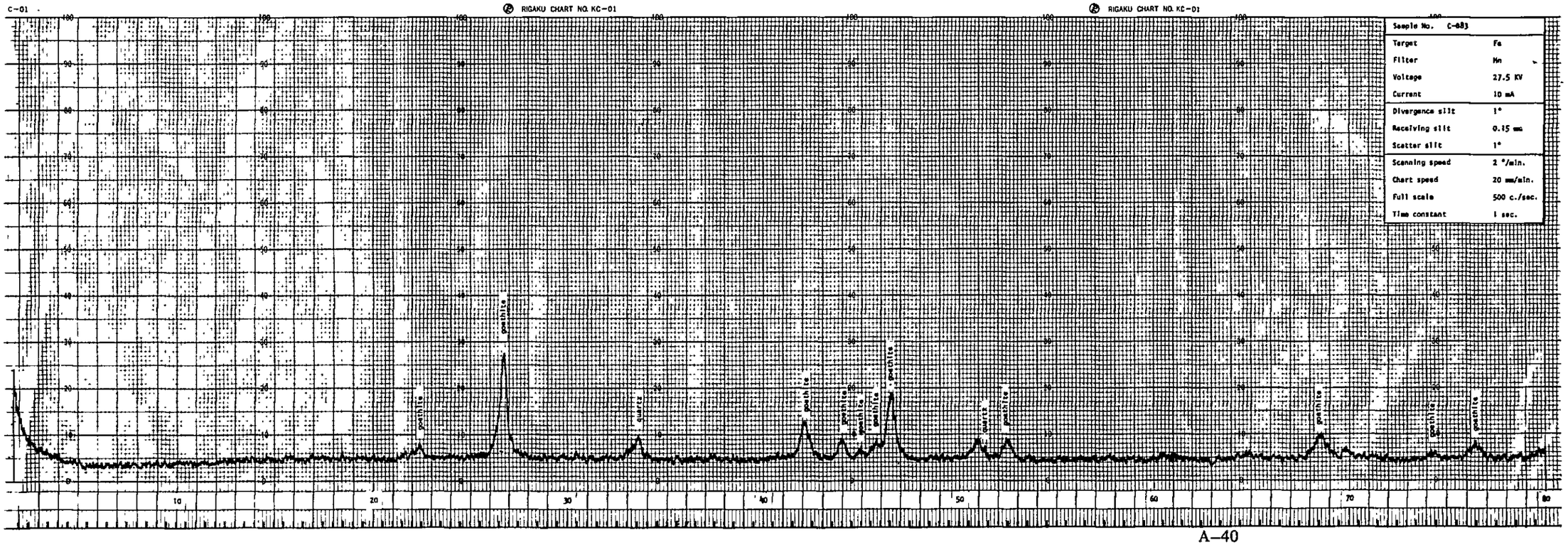

RIGAKU CHART NO. KC-01
RIGAKU CHART NO. KC-01
RIGAKU CHART NO KC-01
quartz
pyrolusite
calcite
quartz
pyrolusite
quartz
pyrolusite
quartz
quartz
pyrolusite
pyrolusite
quartz
Sample No. A-064
Target Fe
Filter Mn
Voltage 27.5 KV
Current 10 mA
Divergence slit 1°
Receiving slit 0.15 mm
Scatter slit 1°
Scanning speed 2 °/min.
Chart speed 20 mm/min.
Full scale 500 c./sec.
Time constant 1 sec.


RIGAKU CHART NO. KC-01
RIGAKU CHART NO. KC-01
pyrolusite
cryptomelane?
quartz
pyrolusite
cryptomelane?
pyrolusite
quartz
pyrolusite
pyrolusite
pyrolusite
quartz
Sample No. B-045
Target Fe
Filter Mn
Voltage 27.5 KV
Current 10 mA
Divergence slit 1°
Receiving slit 0.15 mm
Scatter slit 1°
Scanning speed 2 °/min.
Chart speed 20 mm/min.
Full scale 500 c./sec.
Time constant 1 sec.

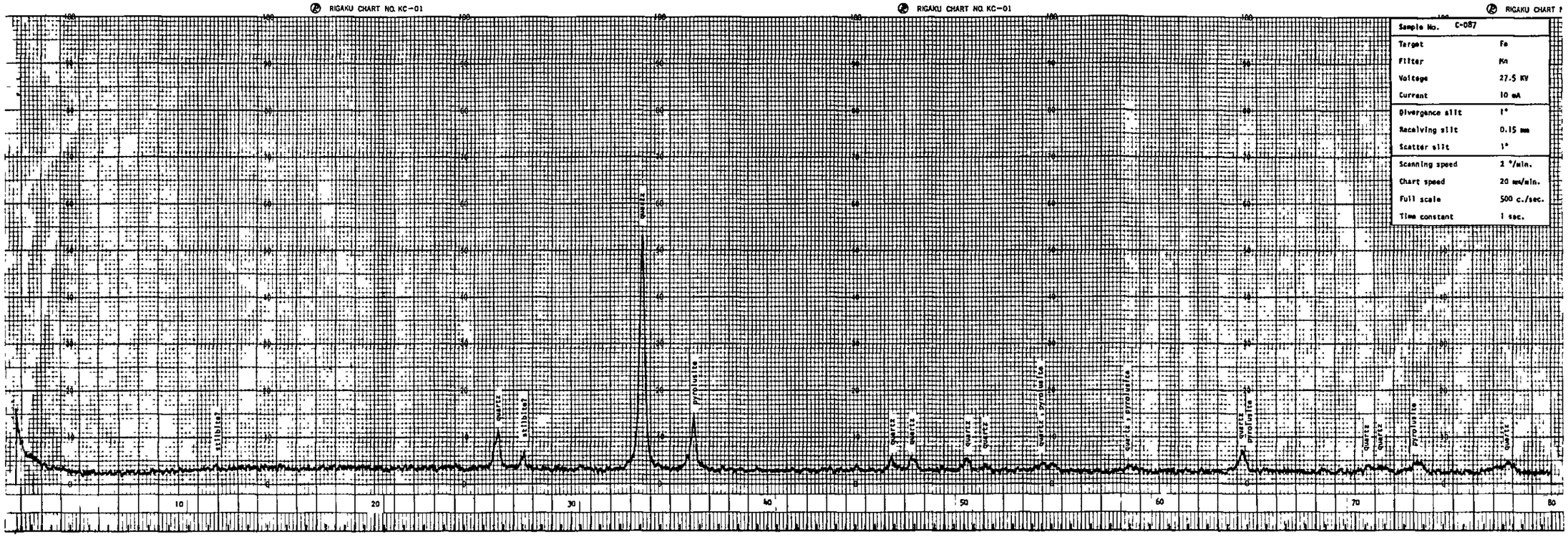

RIGAKU CHART NO. KC-01
Sample No. B-106
Target Fe
Filter Mn
Voltage 27.5 KV
Current 10 mA
Divergence slit 1°
Receiving slit 0.15 mm
Scatter slit 1°
Scanning speed 2 °/min.
Chart speed 10 mm/min.
Full scale 500 c /sec.
Time constant 1 sec.
quartz
cryptomelane ?
pyrolusite, cryptomelane ?
stilbite?
pyrolusite


RIGAKU CHART NO. KC-01
Sample No. C-024
Target Fe
Filter Mn
Voltage 27.5 KV
Current 10 mA
Divergence slit 1°
Receiving slit 0.15 mm
Scatter slit 1°
Scanning speed 2 °/min.
Chart speed 20 mm/min.
Full scale 500 c./sec.
Time constant 1 sec.
quartz
pyrolusite
calcite


RIGAKU CHART NO. KC-01
Sample No. C-040
Target Fe
Filter Mn
Voltage 27.5 KV
Current 10 mA
Divergence slit 1°
Receiving slit 0.15 mm
Scatter slit 1°
Scanning speed 2 °/min.
Chart speed 20 mm/min.
Full scale 500 c./sec.
Time constant 1 sec.
quartz
pyrolusite

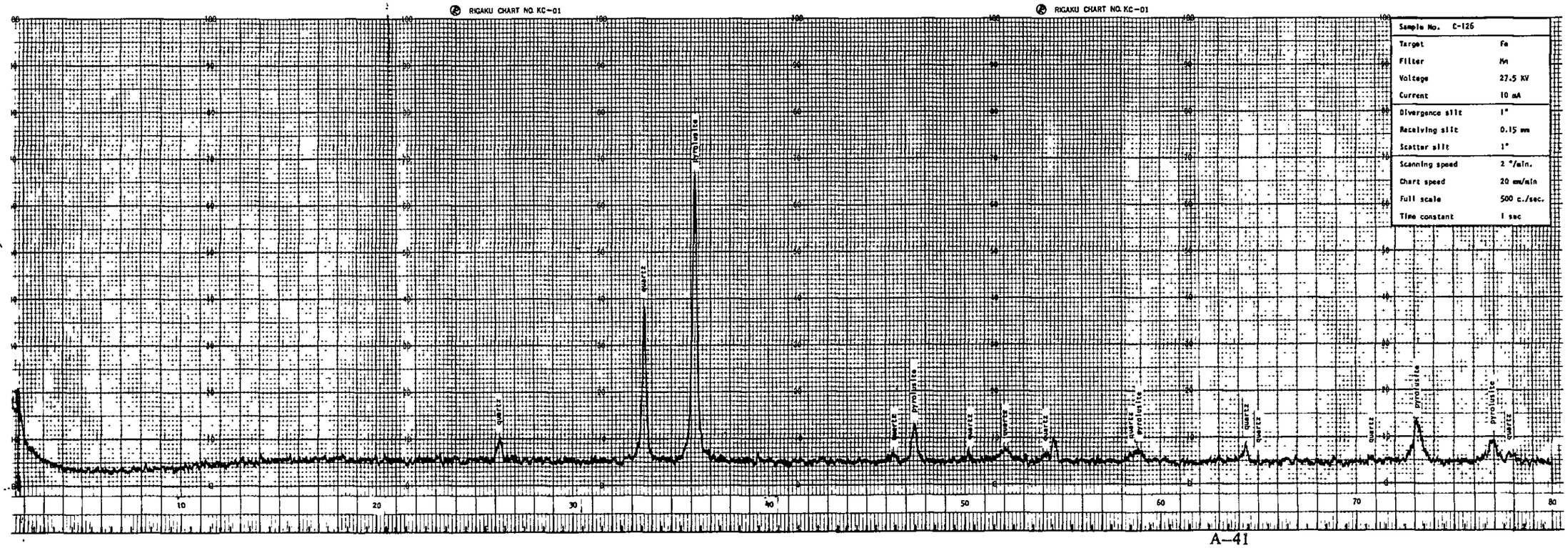

C-01
RIGAKU CHART NO. KC-01
Sample No. C-083
Target Fe
Filter Mn
Voltage 27.5 KV
Current 10 mA
Divergence slit 1°
Receiving slit 0.15 mm
Scatter slit 1°
Scanning speed 2 °/min.
Chart speed 20 mm/min.
Full scale 500 c./sec.
Time constant 1 sec.
goethite
quartz

RIGAKU CHART NO. KC-01

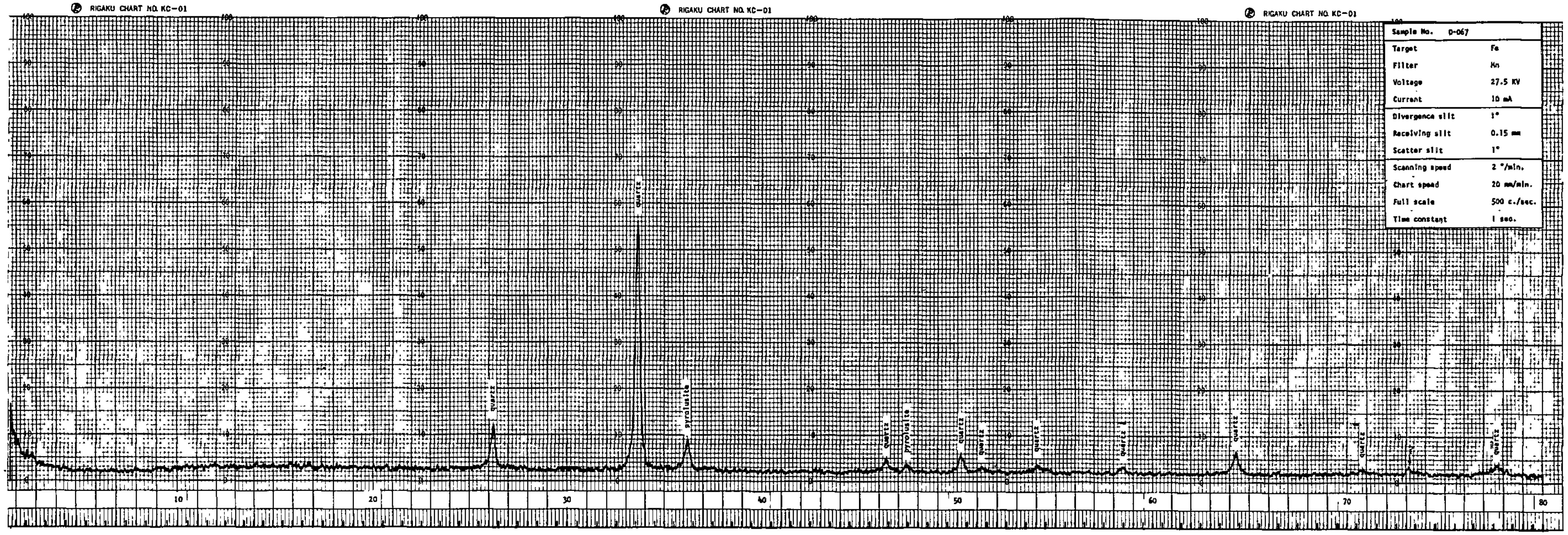


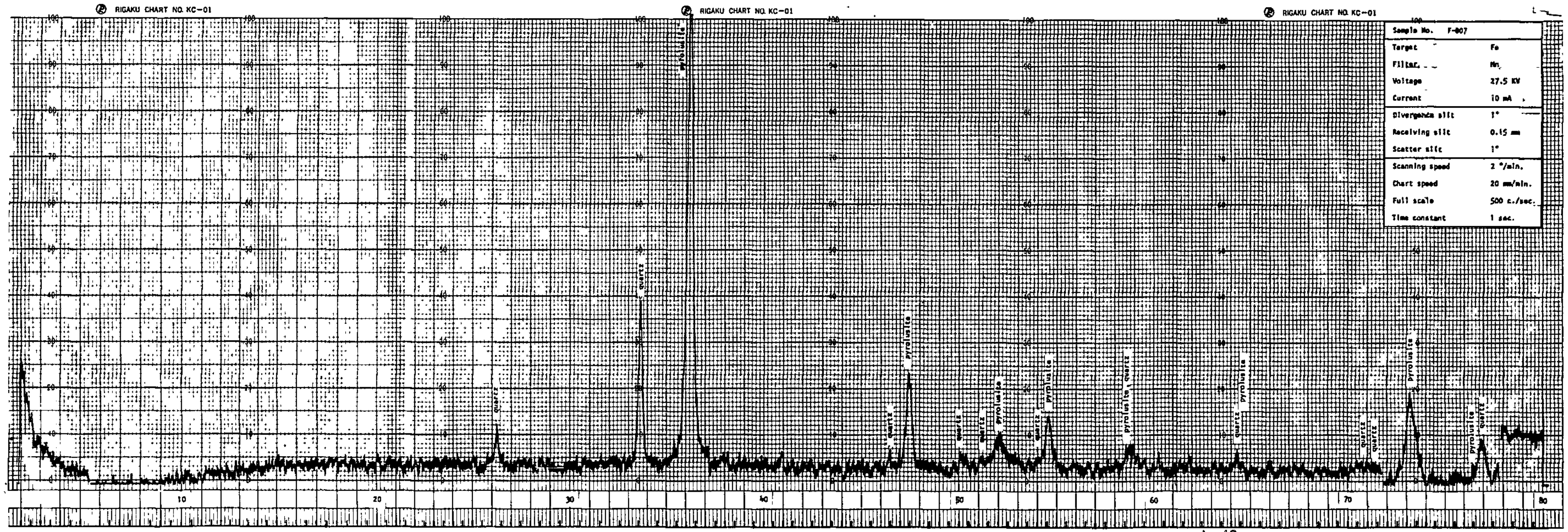
Sample No.	C-087
Target	Fe
Filter	Mn
Voltage	27.5 KV
Current	10 mA
Divergence slit	1°
Receiving slit	0.15 mm
Scatter slit	1°
Scanning speed	2 °/min.
Chart speed	20 mm/min.
Full scale	500 c./sec.
Time constant	1 sec.

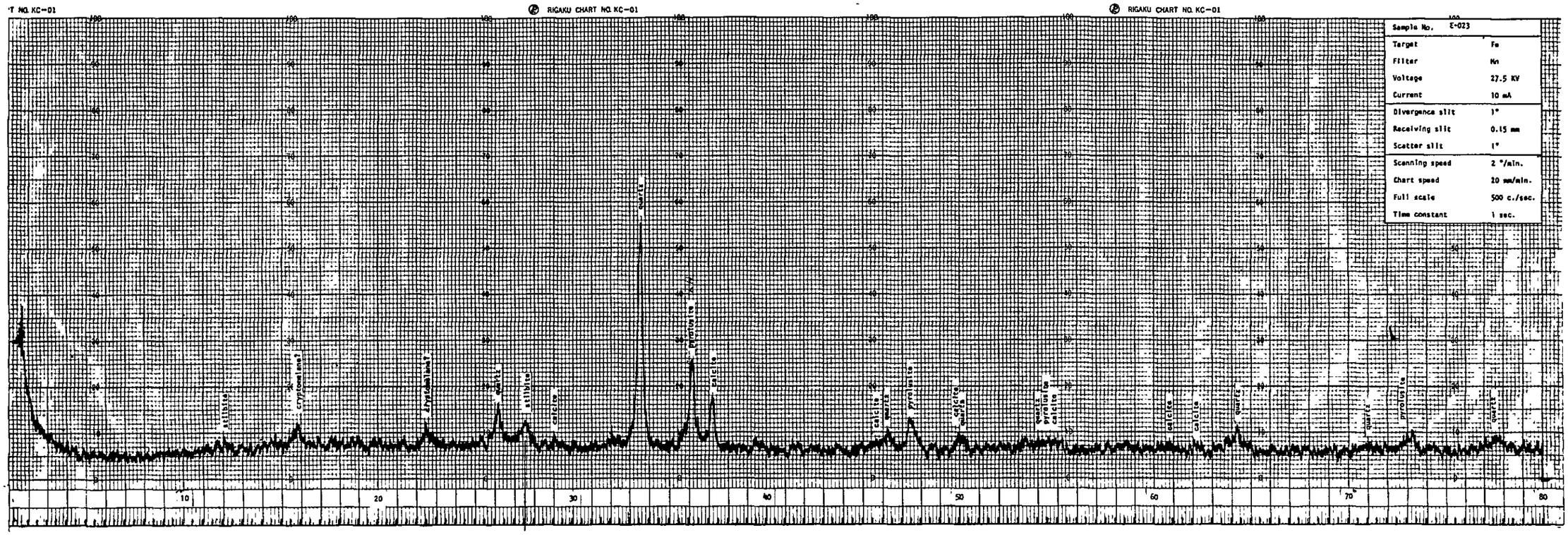
RIGAKU CHART NO. KC-01

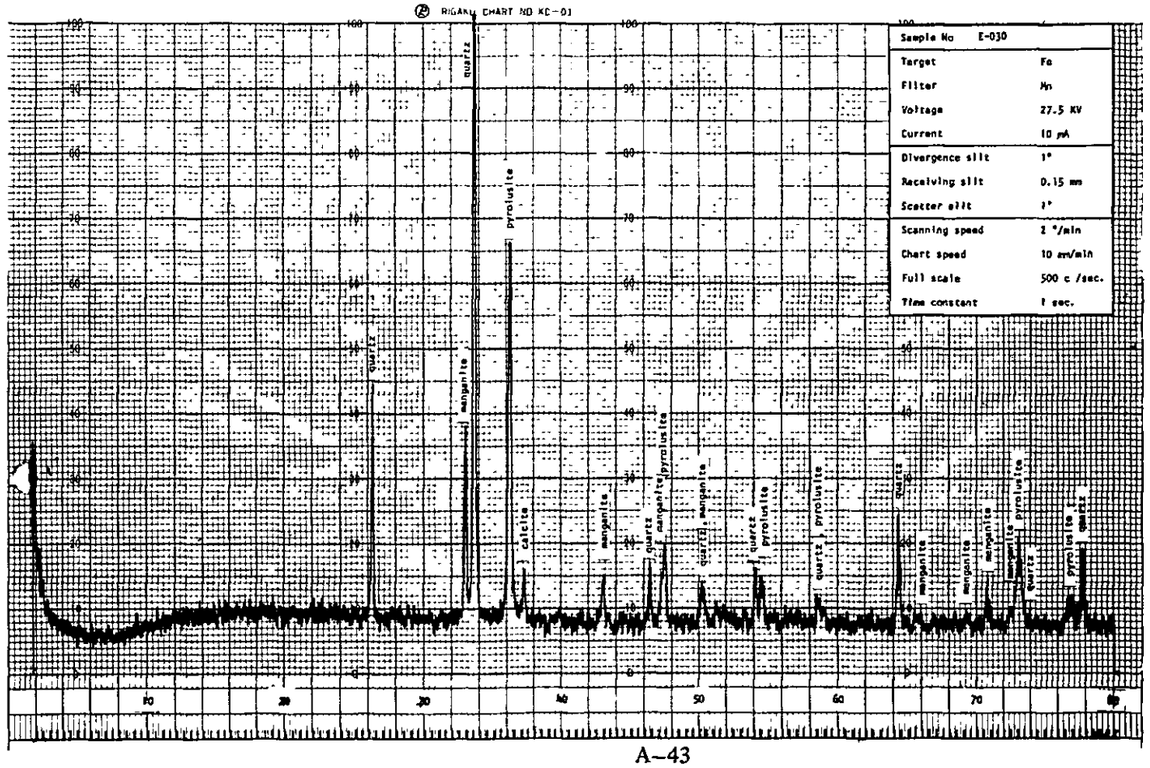


Sample No.	C-126
Target	Fe
Filter	Mn
Voltage	27.5 KV
Current	10 mA
Divergence slit	1°
Receiving slit	0.15 mm
Scatter slit	1°
Scanning speed	2 °/min.
Chart speed	20 mm/min
Full scale	500 c./sec.
Time constant	1 sec


RIGAKU CHART NO. KC-01
Sample No. 0-067
Target Fe
Filter Mn
Voltage 27.5 KV
Current 10 mA
Divergence slit 1°
Receiving slit 0.15 mm
Scatter slit 1°
Scanning speed 2 °/min.
Chart speed 20 mm/min.
Full scale 500 c./sec.
Time constant 1 sec.
quartz
quartz
pyrolusite
quartz
pyrolusite
quartz
10
20
30
40
50
60
70
80


RIGAKU CHART NO. KC-01
Sample No. F-007
Target Fe
Filter Mn
Voltage 27.5 KV
Current 10 mA
Divergence slit 1°
Receiving slit 0.15 mm
Scatter slit 1°
Scanning speed 2 °/min.
Chart speed 20 mm/min.
Full scale 500 c./sec.
Time constant 1 sec.
pyrolusite
quartz
quartz
pyrolusite
pyrolusite
pyrolusite
pyrolusite
10
20
30
40
50
60
70
80


RIGAKU CHART NO. KC-01
RIGAKU CHART NO. KC-01
Sample No. E-023
Target Fe
Filter Mn
Voltage 27.5 KV
Current 10 mA
Divergence slit 1°
Receiving slit 0.15 mm
Scatter slit 1°
Scanning speed 2 °/min.
Chart speed 20 mm/min.
Full scale 500 c./sec.
Time constant 1 sec.
cryptomelane?
cryptomelane?
quartz
albite
calcite
quartz
pyrolusite
calcite
calcite
quartz
pyrolusite
calcite
quartz
quartz
pyrolusite
calcite
calcite
calcite
quartz
quartz
pyrolusite
quartz


RIGAKU CHART NO. KC-01
Sample No. E-030
Target Fe
Filter Mn
Voltage 27.5 KV
Current 10 mA
Divergence slit 1°
Receiving slit 0.15 mm
Scatter slit 1°
Scanning speed 2 °/min
Chart speed 10 mm/min
Full scale 500 c /sec.
Time constant 1 sec.
quartz
pyrolusite
manganite
quartz
manganite
calcite
manganite
quartz
manganite
pyrolusite
quartz
manganite
quartz
pyrolusite
quartz
pyrolusite
manganite
manganite
manganite
manganite
pyrolusite
quartz
pyrolusite
quartz

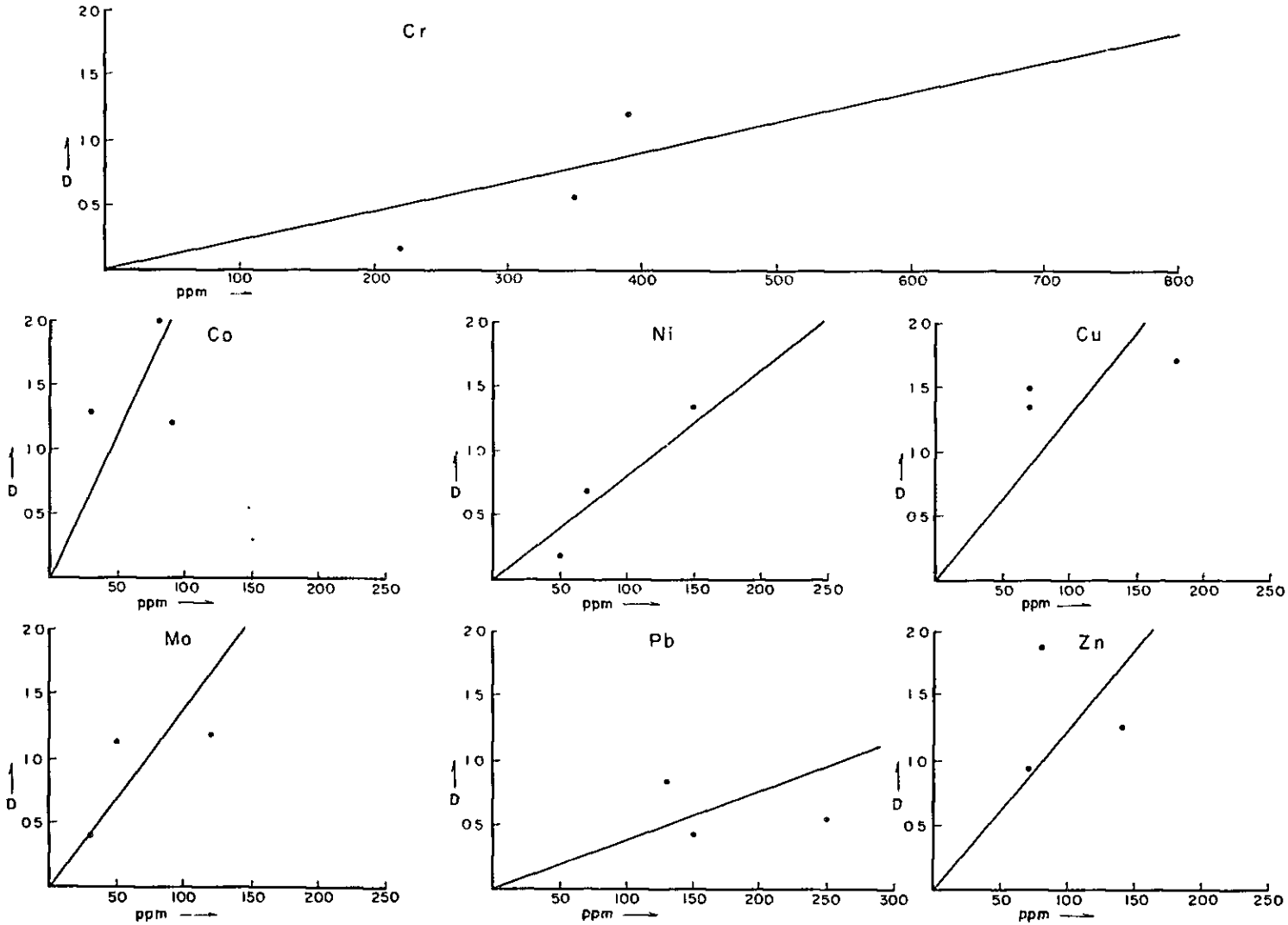


Fig. A-6 Correlation Curve between Density in Emission Spectrography and Content for 7 Elements

Table A-1 Description of Manganese Outcrops

(1)

Outcrop No.	Co-ordination		Strike Dip	Lateral Length (m)	Average Width (m)	Mode of Ore	Host Rock	Tested Sample No	Remarks
	Latitude	Longitude							
1	N2483	E786	N45E, folding	10	0 38	veinlet	grey chert	B126PAX	Mn ore filling in veinlet
2	N2483	E786	N40E, 65E	250	0 14	layer	pale brown muddy chert	B125A	2 Mn layers
3	N2482	E785	N20E, folding	250	12.00	lens, layer	do	C098AS C099AS	Mn nodular zone with Mn layer (Wd 30cm)
4	N2480	E785	N–S 50E	20	4 00	layer	do	D007A	
5	N2483	E785	N55E, 80N	300	0 10	layer	do		
6	N2483	E785	N15W, 60S	50	0.10	layer	do		
7	N2483	E785	N55E, 60N	3	0 40	layer	do		
8	N2480	E785	N5W, 50E	1	0 01	layer	do		
9	N2483	E785	N60E, 90	12	0 10	layer	do	C095A	
10	N2482	E785	N65E, 60N	150	0 10	layer	do	C105A	
11	N2482	E785	N30E, 80N	20	1.00	lens	do		
12	N2482	E785	N60E, 70N	10	0 40	layer	do		
13	N2481	E784	N15W, 60E	40	4 00	lens, layer	do	D006A	Mn nodular zone and thin Mn layers
14	N2483	E784	N74E 55N	80	0 50	layer	do	D070A D072A	
15	N2480	E784	N15E 32E	3	0 05	layer	do		
16	N2482	E784	N78W, 80S	10	0 20	layer	do		
17	N280	E784	N22E, 60E	100	0 30	layer	do	D012AS D013AS D014A	
18	N2482	E784	N50E, 60S	50	0.30	lens, layer	do	C005A	Mn nodular zone (wd.20cm) and Mn layer (wd 10cm)
19	N2479	E784	N25E, 50E	150	6 0	lens, layer	do	B128	Mn nodular zone with Mn layer (wd 10cm)
20	N2482	E784	N40E, 60E	10	0 10	layer	do		
21	N2483	E783	N73E, 70S	5	0 20	layer	do		

(2)

Outcrop No	Co-ordination		Strike Dip	Lateral Length (m)	Average Width (m)	Mode of Ore	Host Rock	Tested Sample No	Remarks
	Latitude	Longitude							
22	N2482	E783	anticline	5	0 20	layer	pale brown muddy chert		
23	N2482	E783	N43E, 30E	5	0 20	layer	do		
24	N2478	E783	N80E, 70N	500	0 15	layer	do	B146 B147	
25	N2484	E783	N80E, 30S	50	0 10	layer	do		
26	N2482	E783	N–S, 32E	4	0 50	layer	do		4Mn layers
27	N2481	E783	N40E, folding	5	0 20	layer	do		
28	N2481	E783	N10W, 60W	150	0 30	layer	do		
29	N2481	E783	N70E, 55N	5	0 20	layer	do		
30	N2486	E782	N70E, 70S	350	0 30	layer, lens	do	D020A D021A D022A D023A D024A D025A	Mn nodular zone (wd 20cm) and Mn layer (wd 10cm)
31	N2484	E782	N80W, 50S	100	0 13	layer	do	C087PX C088AS C089AS	
32	N2484	E782	E–W, 50N	10	0 08	layer	do	C083PXS	limonite filling in veinlet
33	N2483	E782	N75E, 65S	200	0 30	layer	do		
34	N2479	E782	N45E, 80NW	200	0 20	layer	do	B148A B149A B150A	
35	N2484	E782	E–W, 50S	12	0 15	layer	do		
36	N2483	E781	E–W, 50S	10	0 10	layer	do		
37	N2484	E782	N82E, 80N	1	0 01	lens	do		
38	N2483	E782	N75E, 45S	15	0 10	layer	do		
39	N2482	E782	N45E, 65SE	50	0 15	layer	do		
40	N2483	E782	N85E, 15S	5	0 10	layer	do		
41	N2484	E782	N20W, 85E	3	0 15	layer	do		
42	N2484	E782	N40E, 90	80	0.50	layer	do	D018A	

Outcrop No	Co-ordination		Strike Dip	Lateral Length (m)	Average Width (m)	Mode of Ore	Host Rock	Tested Sample No	Remarks
	Latitude	Longitude							
43	N2480	E781	N10E, 50E	150	0 50	layer	pale brown muddy chert		
44	N2484	E781	N43E 20W	100	0 30	layer	do		
45	N2480	E781	N45E 45SE	15	0 10	layer	do		
46	N2479	E781	domic structure	5	0 10	layer	do		
47	N2484	E781	N40E 20E	150	1 40	layer	do	D051A D052A D053A	
48	N2483	E781	N57W, 35S	20	0 30	layer	do		
49	N2480	E781					do		float of Mn ore
50	N2483	E781	N78W 35S	5	0 10	layer	do		
51	N2481	E781	N10W~N80W 75S~80N	160	0 20	layer	do		2 Mn layers
52	N2484	E781	E-W 55S	20	0 20	layer	do		
53	N2484	E781	E-W 55S	50	0 20	layer	do		
54	N2484	E781	N85W, 25N	5	0 10	layer	do		
55	N2484	E781	N25W, 45E	100	0 20	layer	do		
56	N2482	E781	E-W, 85S~85N	50	0 30	layer	do		
57	N2484	E781	N5E 5N	10	0 10	layer	do		
58	N2482	E781	N65W 65~70N	5	0 35	layer	do		
59	N2482	E781	N65W 65~70N	150	0 20	layer	do		
60	N2482	E781	N65W, 85S~60N	80	0 15	layer	do		
61	N2484	E780	N45W 70SW	5	0 20	layer	do		
62	N2481	E780	E-W 70N	3	0 15	layer	do		
63	N2481	E780	E-W, 80~85S	10	0 20	layer	do		
64	N2482	E780	N80W~E-W, 55~65S	140	0 20	layer	do		

Outcrop No	Co-ordination		Strike Dip	Lateral Length (m)	Average Width (m)	Mode of Ore	Host Rock	Tested Sample No	Remarks
	Lautude	Longitude							
65	N2484	E780	basin structure	30	0 30	layer	pale brown muddy chert		
66	N2482	E780	N85E, 30S	50	0 20	layer	do		
67	N2482	E780	N80W, 80S	10	0 20	layer	do		
68	N2484	E780	N70E, 25S	150	0 70	layer	do	D026P A D028A D030A D032A	4 Mn layers
69	N2481	E780	N80E, 90	300	0 60	layer	do		2 Mn layers
70	N2482	E780	N75W, 50S	100	0 30	layer	do		
71	N2481	E780	N80E, 55N	350	0 40	layer	do		
72	N2481	E780	N45E, 60NW	140	0 30	layer	do		
73	N2483	E780	N30W 50W	250	0 90	layer	do	D034A	4 Mn layers
74	N2481	E779	N45E, 50NW	25	0 60	layer	do		
75	N2481	E779	N45E, 80NW	30	0 40	layer	do		
76	N2481	E770	N85E, 80N	300	0 30	layer	do		
77	N2483	E779	N48E, 53S	100	0 30	layer	do		
78	N2483	E779	N30W 60W	200	0.50	layer	do		
79	N2481	E779				layer	do		float of Mn ore
80	N2481	E779	(N70E, 60N)			layer	do		float of Mn ore
81	N2481	E779	N60E, 90	30	0 80	layer	do		
82	N2482	E779	N45W 35SW	25	0 10	layer	do		
83	N2481	E779	N5E 60E	30	1 00	layer	do		
84	N2481	E779	N60E 90	20	1 00	layer	do		
85	N2481	E779				layer	do		float of Mn ore
86	N2486	E779	N70E, 50S	100	0 07	layer	do	B078A	

(5)

Outcrop No	Co-ordination		Strike Dip	Lateral Length (m)	Average Width (m)	Mode of Ore	Host Rock	Tested Sample No	Remarks
	Latitude	Longitude							
87	N2485	E779	N50W, 70S	5	0 50	lens	pale brown muddy chert		
88	N2485	E779	N55W, 70S	50	0 05	lens	do		
89	N2484	E779	N10W, 30W	200	0 25	layer	do		
90	N2484	E779	N20W, 30E	1	0 10	lens	do		
91	N2483	E779	N45W, 60SW	100	0 30	layer	do		
92	N2485	E779	N20W, 50W	70	0 01	veinlet	do		Mn ore filling in veinlet
93	N2484	E779	N10W, 35W	50	0 30	layer	do	C057A	
94	N2484	E779	N15E, 30W	5	0.50	lens, layer	do	C118A C123TS C124TXS	Mn nodular zone (wd 30cm) and Mn layer (wd 20cm)
95	N2483	E779	N50W, 45S	350	1 00	layer	do	D039AS D040PA D041A D042AS D044A D047A D049A	8 Mn layers
96	N2484	E779	N60W, 20S	7	0 25	layer	do		
97	N2484	E779	N40W, 40W	15	0 50	layer	do	C041A C040PX	
98	N2485	E779	N60W, 65S	50	0 10	layer	do		
99	N2484	E779	N40W, 20W	20	4.00	layer	do	C032A	
100	N2484	E779	N20W, 25S	4	4 00	layer	do		
101	N2483	E779	N50W, 60S	1	1 00	veinlet	do		Mn ore filling in veinlet
102	N2485	E779	E–W, 60N	150	0.12	layer	do	B117A	
103	N2483	E778	N40W, 70W	3	0 10	layer	do		
104	N2484	E778	N50W, 60S	5	0.50	lens	do		
105	N2484	E778	N45W, 65SW	50	0 15	layer	do		
106	N2484	E778	N40W, 20W N75E, 25S	6 10	0.50 0 20	layer	do	C024PX	
107	N2484	E778	N65W, 45S	100	10 00	layer	do		

Outcrop No	Co-ordination		Strike Dip	Lateral Length (m)	Average Width (m)	Mode of Ore	Host Rock	Tested Sample No	Remarks
	Latitude	Longitude							
108	N2484	E778	N55W, 70S	20	0 10	layer	pale brown muddy chert		
109	N2484	E778	N40W, 50W	20	3 30	lens layer	do		Mn nodular zone (wd 3 00m) and Mn layer (wd 0 30m)
110	N2485	E778	EW~N45W, 60S	1510	0 60	layer	do		4 Mn layers
111	N2486	E778	N80E, 15S	20	0.30	layer	do		
112	N2486	E778	N60W, 75N	20	1.00	layer	do		
113	N2486	E778	N45W, 40NE	5	0 10	layer	do		
114	N2482	E778	N25W, 70W	70	0 65	layer	do	C047A C048A C049A	5 Mn layers
115	N2481	E777	N60E, 60N	25	3 00	layer	do	C051A C052A C053A	3 Mn layers
116	N2485	E777	E-W, 50S	430	0 33	layer	do	B137A B139A B140A	
117	N2484	E777	N80W, 55S	500	5 00	layer	do	B141A B142A B143A B144A B145A	5 Mn layers
118	N2485	E777	E-W, 65S	8	4 00	layer	do		
119	N2485	E777	N80W, 70N	12	0 30	layer	do		
120	N2485	E777	E-W, 60S	50	0 60	layer	do		
121	N2485	E777	N75E, 70~80N	140	0 30	layer	do		
122	N2484	E777	N85W, 50S	140	0 20	layer	do		
123	N2484	E777	N75W, 40S	650	0.34	layer	do	B043A B044A B045P,A,S,X B120AS B121A B123AS B124	2 Mn layers
124	N2483	E777	N65E, 70S	65	0 40	layer	do	B136A	
125	N2488	E777	N70E, 70S	150	0 30	layer	do		
126	N2488	E777	N30E, 45E	50	1.00	layer	do		
127	N2485	E777				layer	do		float of Mn ore
128	N2486	E777	N50W, 90	160	0 40	layer	do		

Outcrop No	Co-ordination		Strike Dip	Lateral Length (m)	Average Width (m)	Mode of Ore	Host Rock	Tested Sample No	Remarks
	Latitude	Longitude							
129	N2484	E777	E–W, 90	300	0 65	layer	pale brown muddy chert		
130	N2484	E777	N85E, 75N	25	0.38	layer	do	B132A	
131	N2484	E777	N55E, 65N	2	0 35	layer	do		
132	N2484	E777	N30~60E, 70N	160	0.30	layer	do		
133	N2483	E777	N40E, 70W	200	0 67	layer, lens	do	B103A B105A B106PAX	Mn nodular zone (wd 40cm) and Mn layer (wd 22cm)
134	N2484	E776	N80E, 80N	6	0 80	layer	do		
135	N2483	E776	E–W, 70~85N	4	0.20	layer	do		
136	N2485	E776	N70E, 80S	500	1 75	layer	do	D054AS D055A D058A D061A D063A, S D066A D067PAX	4 Mn layers
137	N2485	E776	folding	20	0 30	layer	do		
138	N2484	E776	N50E, 25S	5	0 07	lens	do		
139	N2483	E776	N32W, 15E	10	0.20	layer	do		
140	N2484	E776	N–W~N50E, 50S~55N	500	0 44	layer	do	B092A B095A B096A B098A B099A B100A B101A	3 Mn layers
141	N2487	E776					do		foalt of Mn Ore
142	N2484	E776	N45E, 50SE	300	0.29	layer	do	B084A B085A B086A B091A	
143	N2485	E775	N27E, 80E	20	0 40	layer	do	D069A	2 Mn layers
144	N2490	E770	E–W, folding	50	2 00	layer	do	E030AS	
145	N2485	E770	folding	300	0.30	lens	do	E023PASX	
146	N2485	E770	N65W, 60S	40	1.20	layer	do		3 Mn layers
147	N2480	E765	folding	30	0.40	lens	do		3 Mn nodular zones
148	N2480	E765	N50E, 50N	150	0 40	layer	do	E019AS	

Outcrop No	Co-ordination		Strike Dip	Lateral Length (m)	Average Width (m)	Mode of Ore	Host Rock	Tested Sample No	Remarks
	Latitude	Longitude							
149	N2480	E765	N60E, folding	500	0 40	layer	pale brown muddy chert		
150	N2480	E765	N10E, folding	500	0 40	layer	do		
151	N2475	E780	N10E, 30W	20	2 00	lens	do	E007AS	
152	N2475	E780	folding	150	0 50	lens	do		3 Mn layers
153	N2465	E775	folding	200	0 15	lens	do	E003AS	
154	N2465	E755	folding	200	1 00	lens	do	E028ASX	
155	N2465	E760	N20W, 50W	50	1 00	lens	do		
156	N2460	E765	N25W, folding	200	0 20	layer	do		
157	N2460	E760	N45E, 70NW	100	2 00	layer	do		
158	N2460	E760	N20W, 90	100	4 00	lens	do	E026AS	
159	N2455	E760	N20W, 50E	300	9 00	layer	do	E027PASX	
160	N2455	E770	N25E, 90	600	4 00	lens	do	E037PAS	2 Mn layers
161	N2450	E765	N40W, 40E	100	2 50	lens	do	E076AS	
162	N2440	E760	N10E, folding	40	0 35	lens	do	E059AS	
163	N2445	E755	N10E, 30E	100	0 30	lens	do	E067AS	
164	N745	E745	folding	100	1 50	lens	do	E091AS	
165	N745	E745	N80W, folding	130	1,50	lens	do		
166	N750	E750	N20W, 70E	30	1 00	lens	do		
167	N750	E750	N-S, folding	200	0.80	lens	do	E089AS	2 Mn layers

Table A-2-1 Microscopic Observation of Thin Section (Sedimentary Rock)

No	Sample No	Co-ordination		Rock name	Fragments								Matrix									Characteristics
					Rocks		Minerals															
		Latitude	Longitude		gronophyre	mudstone	quartz	potash feldspar	plagioclase	biotite	sericite	opaque minerals	quartz	calcite	sericite	kaoline	carbonate	clay minerals	hematite	limonite	opaque minerals	
1.	A004	N 2482	E 781	shale			●										◎	◎				
2	A006(b)	2482	781	shale							●					●	●	◎	●		●	laminated, radiolaria rare
3	A055	2483	776	coarse sandstone	●		◎	○	○	●		○					◎					micritic, sorting badly, spotted manganese ore
4	B135	2484	774	medium sandstone		◎	◎	●	○	●		●			●		◎					micritic, sorting badly
5	C123	2484	779	muddy chert									◎		●			◎				laminated, radiolaria abundant
6	C124	2484	779	muddy chert							●		◎					◎	●	●	●	laminated, radiolaria, spotted manganese ore, pale brown chert
7	C125	2482	780	shale							●		●		●			◎		●		radiolaria rare
8	D003	2481	783	limestone			●							◎								spartic, pellet abundant
9	D009	2483	783	chert									◎	○			●				○	
10	D016	2479	785	muddy chert														◎				radiolaria abundant
11	D019	2485	782	limestone										◎								porous, pellet
12	F001	2481	782	chert									◎				●					brecciated, radiolaria abundant,
13	F023	2485	783	limestone			●							◎								spartic, pellet rare
14	F049	2488	777	manganese ore									◎								◎	laminated, manganese minerals, radiolaria abundant

◎ : abundant ○ : common ● : rare

Table A-2-2 Microscopic Observation of Thin Section
(Igneous Rock and Metamorphic rock)

	Sample No.	Location	Rock Name	Texture	Minerals: Phenocryst: quartz	potash feldspar	plagioclase	biotite	hornblende	alkali amphibole	augite	hypersthene	olivine	opaque minerals	Groundmass: quartz	potash feldspar	plagioclase	biotite	hornblende	clinopyroxene	orthopyroxene	sphene	apatite	zircon	cassiterite	opaque minerals	Secondary minerals: chlorite	epidote	sericite	zeolite	quartz	siderite	calcite	kaoline	titanite	prehnite	serpentine	Remarks
lava	E040	N2455, E775	trachyandesite	porphyritic trachytic			◎							●			◎										●					●	●					porous, strongly altered
lava	E065	2440, 755	basalt	porphyritic			◎				◎	●		●			◎			○							●			●		●	●					porous, $Ab_{70}An_{30}$~$Ab_{10}An_{90}$
younger intrusive rocks	B131(1)	2478, 783	diorite porphyrite	porphyritic subophitic			◎				◎			○			◎	●								●											$Ab_{70}An_{30}$~$Ab_{50}An_{50}$
younger intrusive rocks	B131(3)	2477, 783	diorite porphyrite	porphyritic			◎				●	●		○			◎										●			●		●	●					$Ab_{50}An_{50}$~$Ab_{30}An_{70}$
younger intrusive rocks	D075	2480, 784	dolerite	porphyritic					◎		◎			○			●		◎	○		●								●								bearing titan augite alkali-dolerite
younger intrusive rocks	E024	2485, 770	andesite	porphyritic	●		◎		○		○	●		○	○		◎			○						○	●		●		●		●					$Ab_{90}An_{10}$~$Ab_{30}An_{70}$
younger intrusive rocks	E025	2485, 770	granite porphyry	porphyritic intergranuler	◎		◎								◎		◎										●					●	●					$Ab_{90}An_{10}$~$Ab_{70}An_{30}$
younger intrusive rocks	E047	2450, 770	hornblende gabbro	cataclastic			◎		◎																		●								●			dyke
younger intrusive rocks	E056	2470, 780	diorite	porphyritic subophitic			◎		●		○			○													●		●				●					dyke, $Ab_{30}An_{70}$~$Ab_{10}An_{90}$
younger intrusive rocks	E060	2445, 765	dolerite	intergranuler vitroporphiritic							○	◎		●			◎	●		◎	◎												●					autometamorphism
younger intrusive rocks	E061	2445, 765	dolerite	porphyritic					◎		◎	○	●	○			○	●		◎																		porous
younger intrusive rocks	E062	2445, 765	dolerite	porphyritic		◎		○		◎	◎			○								●	●					●		●								alkali-dolerite
younger intrusive rocks	E064	2445, 760	diorite	subophitic			◎	●	●		○			●				●								●		●			●		●				sheet, biotite is altered to chlorite $Ab_{90}An_{10}$~$Ab_{70}An_{30}$
younger intrusive rocks	E066	2445, 750	diorite	subophitic porphyritic			◎	●	○		◎			○						●							●	●		●			●	●				dyke plagioclase is altered to kaoline
younger intrusive rocks	E071	2450, 750	diorite	porphyritic			◎		◎														●				●			●			●	●				dyke, $Ab_{50}An_{50}$~$Ab_{10}An_{90}$
older intrusive rocks	E082	2455, 750	aplite	graphic	◎	◎	◎		●					●										●	●		●	●					●			●		hornblende is altered to chlorite
older intrusive rocks	E093	2445, 745	andesite	subophitic			◎				◎			◎									●		●	●	●	●										$Ab_{70}An_{30}$~$Ab_{50}An_{50}$
older intrusive rocks	E094	2445, 745	granite porphyry	porphyritic micrographic	◎	◎	◎	●						●	◎	◎	◎						●				●	●				●					
older intrusive rocks	E097	2450, 745	dolerite	porphyritic subophitic			◎		●		◎	●		●													●									●	$Ab_{70}An_{30}$~$Ab_{10}An_{90}$
basement	E083	2455, 750	diorite porphyrite	glomeroporphyritic	●		◎		◎					●									●	●			●		●				●					$Ab_{70}An_{30}$~$Ab_{50}An_{50}$
basement	E092	2445, 745	granite	equigranular	◎	◎	◎	●	●					●									●	●			●		●				●					
basement	E095	2450, 745	diorite porphyrite	microequigranular	○	◎	◎	●	◎					●									●				●	●										$Ab_{90}An_{10}$~$Ab_{50}An_{50}$
basement	E096	2450, 745	amphibolite	equigranular			◎	○	◎					●	●							●	●				●	●	●									$Ab_{90}An_{10}$~$Ab_{70}An_{30}$

◎ : abundant ○ common ● : rare

Table A-3 Microscopic Observation of Polished Section

No	Sample No	Co-ordination		Manganese ore	Texture	Ore minerals					Pseudo-morph (origin)	Fossils	Characteristics
		Latitude	Longitude			pyrl	man	crpt	hem	goe			
1	A007	N2487	E781	massive	colloform	◎		●				○	pyrl sub~anhedral crpt in veinlets
2	A036(b)	2485	771	banded	fibrous	●							
3	A064	2481	781	nodular	spherulic fibrous colloform	◎		●				○	pyrl anhedral crpt in veinlets
4	B045	2484	779	massive		◎		○				○	pyrl anhedral crpt anhedral
5	B106	2483	777	banded	colloform	◎						◎	pyrl anhedral
6	B126	2482	786	network	pisolitic fibrous	●	●	●				●	pyrl anhedral aragonite
7	C024	2484	778	vein shaped		◎						◎	pyrl euhedral
8	C040	2484	779	disseminated	disseminated colloform	◎							pyrl euhedral
9	C083	2484	782	massive limonite	brecciated					◎		●	
10	C087	2484	782	banded	colloform fibrous~spherulitic	◎	●					○	pyrl subhedral
11	C107	2484	786	ferrugnous quartz	colloform	●	●		●				pyrl anhedral
12	C126	2484	779	massive		◎							pyrl euhedral
13	D026	2484	780	banded	fibrous colloform	◎	●	●			pyrl (man)	◎	
14	D040	2483	779	banded	colloform	◎							pyrl subhedral
15	D067	2484	776	brecciated	brecciated colloform	○							pyrl subhedral
16	F007	2480	781	massive		◎							pyrl anhedral
17	F045	2488	777	brecciated	colloform~pisolitic	●		●				●	pyrl anhedral
18	F047	2488	777	massive	colloform fibrous	◎		●			pyrl (man)	●	pyrl subhedral
19	F048	2488	777	disseminated	disseminated	◎							pyrl sub~euhedral
20	E008	2475	780	massive	disseminated	◎						○	pyrl anhedral
21	E010	2475	770	massive		◎							pyrl anhedral
22	E014	2460	765	nodular	stringer	○							pyrl sub~anhedral
23	E023	2485	770	nodular	fibrous	◎					pyrl (man)	◎	
24	E027	2460	760	banded	colloform · disseminated	◎							pyrl euhedral
25	E030	2490	770	massive	disseminated	○	◎				pyrl (man)		man euhedral
26	E037	2455	770	nodular		◎							pyrl sub~euhedral

◎ abundant ○ common ● rare

Abbreviations

pyrl pyrolusite man manganite crpt cryptomelane
hem hematite goe goethite

Table A-4-1 List of Fossil

Species of Foraminifera	Formation	MTu									MTl								Hm
	Sample No	E033	E034	E035	E051	E052	E053	E054	E084	E100	B071	E031	E032	E050	E081	E086	E058	E072	E070
	Co-ordination Longitude	E 770	770	770	760	755	755	755	750	755	776	770	770	760	750	750	760	745	750
	Latitude	N 2490	2495	2495	2480	2480	2480	2480	2460	2435	2484	2490	2490	2480	2460	2460	2440	2450	2440
	Estimated age	lower Eocene (Ilerdian)	lower Eocene (Ilerdian)	not identified	lower Eocene (Cuisian)	not identified	lower Eocene (Cuisian)	lower Eocene (Cuisian)	lower Eocene (Ilerdian)	lower Eocene (Ilerdian)	not identified	not identified	lower Eocene (Ilerdian)	lower Eocene (Ilerdian)	lower Eocene (Ilerdian)	lower Eocene (Ilerdian)	not identified	upper Cretaceous (Maastrichtian)	not identified
Nummulites perforatus Monfort					○					○									
N. cf *perforatus* Monfort									○						○				
N burdigalensis (De la Harpe)							○	○											
N gizehensis Forskal										○				○					
N sp		○					○	○								○			
Alveolina lehneri Hottinger					○														
A. ilerdensis Hottinger					○														
A cf *ilerdensis* Hottinger															○				
A. corbarica Hottinger					○											○			
A. trempina Hottinger														○					
A. avellana Hottinger																○			
A. cf *avellana* Hottinger													○						
A. fornasinii Checchia-Rispoli														○					
A. subpyrenarica Leymerie																○			
A. sp			○																
Siderolites sp.							○												
Heterostegina sp							○												
Eorupertia sp							○									○			
Dictyoconus indicus Davies	○																		
D. sp													○						
Asterocyclina sp.										○									
Discocyclina sp										○						○			
Fabiania sp													○						
Omphalocyclus macroporus (Lamark)																		○	

Table A-4-2 List of Radiolaria

Species of radiolaria	Formation	Sample No.	Co-ordination: Latitude	Co-ordination: Longitude	Estimated age	Hm: A006 (b)	Hm: C123	Hm: C124	Hm: C125	Hm: C127	Hm: D016	Hm: F001 (1)	Hm: F049
			N2482	E781		No identified	Late Jura. ~ Early Creta (Tithonian ~ Valanginian)	Late Jura. ~ Early Creta (Tithonian ~ Valanginian)	No identified	Early Creta	Late Jura ~ Early Creta (Tithonian ~ Valanginian)	Early Creta. ~ Early Creta (Bernasian ~ Valanginian)	Late Jura ~ Early Crea (Tithonian ~ Valanginian)
Mirifusus mediodilatatus (Rust)			2484	779			○	○				○	
M sp.			2484	779							○		○
Parvicingular baesii(Parona)			2484	779			○	○				○	
P cf *boesii* (Parona)			2484	779									○
P *cosmoconica* (Foreman)			2484	779				○			○		
P *cosmoconica*			2484	779			○						
P cf. *citae* Pessagne			2484	779								○	○
P. sp			2484	779									○
P. ssp			2484	779							○		
Archaeodictyomitra apiara (Rüst)			2484	779							○		
A cf. *apiara* (Rüst)			2484	779				○			○		
A. (?) cf *rigida* Pessagno			2484	779								○	○
A. (?) sp.			2484	779						○			
Thanarla cf *conica* (Aliev)			2484	779							○	○	
T cf *conica*			2484	779				○					
T. aff. *conica* (Aliev)			2484	779			○						
T aff. *conica*			2484	779								○	
Napara(?) sp.			2484	779				○					
Podobrusa sp			2484	779			○	○					
Pseudodictyomitra sp			2484	779			○	○					
Mita sp. B. Pessagno			2484	779			○						
M sp.			2484	779			○	○				○	
Xitus (?) sp.			2484	779						○	○	○	○
Dictyomitra sp			2484	779									○
HAGIASTRIDAE Gen & sp. indet			2484	779									○
Hsuum sp			2484	779								○	
Ultranapora sp			2484	779								○	
Obesacapsula rotunda (Hinde)			2484	779								○	
Obesacapsula (?) cf *rotunda* (Hinde)			2484	779				○					
Sethocapsa trachyostraca Foreman			2484	779								○	
S. *ielostraca* Foreman			2484	779								○	
S. *citae* Foreman			2484	779				○					
S. cf. *citae* Foreman			2484	779			○					○	
Syringocapsula agolarium Foreman			2484	779								○	
Syringocapsa agolarium Foreman			2484	779			○						
Syringocapsa agolarium			2484	779						○			
Pantarellium corriganensis Pessagno			2484	779			○	○				○	
P sp			2484	779			○	○				○	
Cecrops cf *septemporatus* Pessagno			2484	779								○	
Acaeniotyle umbilicata (Rüst)			2484	779				○				○	
Pseudocrncella sp.			2484	779								○	
Paranaella (?) sp.			2484	779			○	○				○	
Patullibracchium ssp.			2484	779					○ ?	○			
Archaeospongoprunum sp			2484	779			○	○		○			
Allevium helenae Schaaf			2484	779			○	○				○	
Acanthocircus dicranocanthos (Squinabol)			2484	779									○
Acanthocircus cf. *dicranocanthos*			2484	779								○	
Eucyrtis (?) sp.			2484	779						○			
Crypto-thoracic nassellaria			2484	779							○		○
Crypto-cephalic nassellaria			2484	779									○
Patullibracchium			2484	779									

Table A-5 Result of X-ray Powder Diffractive Analysis

No	Sample No	Co-ordination		Rock name	Minerals										Remarks
		latitude	longitude		qz	pl	cal	ara	stl	pyrl	man	crpt	goe	mag	hem	
1	A007	N2482	E781	massive and fine grained manganese ore	●					◎						
2	A036(b)	2485	771	manganese ore	◎					●						
3	A064	2481	781	banded manganese ore	○		●			●						
4	B045	2484	779	massive and fine grained manganese ore	●					◎		●?				
5	B065(1)	2484	776	white chert	○		●									altered part of grey chert
6	B065(2)	2484	776	grey chert	○											
7	B106	2483	777	manganese ore	◎				●?	○		●?				
8	B126	2483	786	network manganese ore	◎			●?								
9	B024	2484	778	manganese ore	○		●			○						with quartz vein
10	C040	2484	779	disseminated manganese ore	○					●						
11	C083	2484	782	massive limonite	●								◎			
12	C087	2484	782	banded manganese ore	○				●?	●						
13	C107	2484	786	reddish siliceous rock	◎											
14	C112	2481	784	dark brown calcite	●		○									vein
15	C124	2484	779	pale brown chert	◎		●									
16	C126	2484	779	massive and coarse grained manganese ore	○					◎						
17	D033	2483	780	yellow chert	◎											
18	D067	2484	776	brecciated manganese ore	○					●						
19	D076	2480	784	pale green~white siliceous rock	◎	●										
20	F001(2)	2481	782	white muddy rock	◎		●									altered part of red chert
21	F007	2480	781	massive and coarse grained manganese ore	○					◎						
22	F041	2487	776	light grey limestone	●		◎							○	●	
23	F047	2488	777	massive and coarse grained manganese ore	○					◎						
24	F049	2488	777	black siliceous rock	◎											black siliceous part of manganese ore
25	E008	2475	780	manganese ore	○					◎						
26	E023	2485	770	nodular manganese ore	○		●		●	◎		●?				
27	E027	2460	760	banded manganese ore	◎		●			○						
28	E028	2465	755	manganese ore	◎		●			○						
29	E030	2490	770	disseminated manganese ore	◎		●			◎	○					
30	E077	2450	765	bedded manganese ore	◎		●			◎						

◎ abundant ○ common ● rare ?, uncertain

Abbreviations

qz quartz pl plagioclase cal calcite ara aragonite stl stilbite
pyrl pyrolusite man manganite crpt cryptomelane goe goethite mag magnetite hem hematite

Table A-6 Result of Chemical Analysis

(1)

No	Sample No	Location		Type of Ore	Sampling Width (cm)	Content of Elements							Remarks
		Outcrop No.	Co-ordination			Mn(%)	MnO_2(%)	SiO_2(%)	Fe(%)	S(%)	P(%)	Mn/Fe	
1	A009	59	N-2482 E- 781	layered ore	20	8 76	12.36	80.66	0.38	0 06	0 023	23.05	
2	A012	59	N-2482 E- 781	do	20	23.57	36 84	56.30	0 26	0.16	0 039	90 65	
3	A014	59	N-2482 E- 781	do	20	8.33	14.32	71.95	0 63	0 07	0 020	13.22	Mn layer 2cm
4	A016	60	N-2482 E- 781	do	15	17 43	27.53	66.05	0 41	0.18	0 024	42 51	Mn layer 2~3cm
5	A018	60	N-2482 E- 781	do	10	18.80	26 86	67.59	0 38	0 08	0 024	49 47	
6	A020	59	N-2482 E- 781	do	15	23 96	37 84	55.73	0.32	0 04	0 034	74 88	
7	A021(a)	63	N-2481 E- 780	do	20	7 88	12.13	80.28	0 51	0 16	0.016	15.45	Mn layer 1cm
8	A021(b)	63	N-2481 E- 780	do	35	20 99	32 76	58.90	0 45	0.14	0 035	46.64	Mn layer 3~4cm
9	A026(a)	118	N-2485 E- 777	do	20	7.85	12.38	80.65	0 43	0 16	0 010	18 26	
10	A027	118	N-2485 E- 777	do	10	11.02	17 43	72 84	0.53	0 11	0 013	20 79	
11	A029	120	N-2485 E- 777	do	65	8 61	13 17	77 19	0 58	0 08	0 014	14 84	Mn layer 1~2cm partly 3cm
12	A031	120	N-2485 E- 777	do	55	7.23	10 77	82.34	0 47	0 07	0 014	15.38	
13	A032	120	N-2485 E- 777	do	65	8 06	12.59	79.52	0 55	0 14	0 017	14 65	Mn layer 2~3cm
14	A034	121	N-2485 E- 777	do	30	9 89	15.21	72.87	0 46	0 07	0.016	21 50	
15	A036(a)	121	N-2485 E- 777	do	25	9 29	14 76	79 63	0 42	0 04	0 017	22 12	Mn layer 1~2cm
16	A038	121	N-2485 E- 777	do	35	11 65	18 01	63 41	0 47	0 07	0 021	24 79	
17	A039	121	N-2485 E- 777	do	15	12.66	19 50	66 01	0 42	0.08	0.038	30 14	Mn layer 1~2cm
18	A043	132	N-2484 E- 777	do	30	7.99	12 13	76 14	0 41	0 06	0 020	19 49	Mn layer 2cm
19	A044	132	N-2484 E- 777	layered ore nodular ore	60	6 29	10 01	73.36	0 53	0 12	0 021	11 87	layered ore 40cm nodular ore 20cmn
20	A045	132	N-2484 E- 777	layered ore	35	7 42	11 79	75.46	0 54	0 06	0 022	13 74	Mn layer 1~2cm
21	A048	143	N-2484 E- 777	do	80	12.35	19 17	69.64	0 30	0 07	0 029	41 17	Mn layer 3~5cm 2 beds
22	A050	135	N-2483 E- 776	do	20	10 70	15 15	76 94	0.39	0 06	0 015	27 44	Mn layer 0.5cm
23	A051	135	N-2483 E- 776	layered ore nodular ore	50	13.91	21 60	66.31	0 47	0 05	0 021	29 60	layered ore 30cm nodular ore 20cm
24	A052	135	N-2483 E- 776	layered ore	10	16 84	25.98	53.65	0.31	0 10	0 037	54.32	Mn layer 0.5cm
25	A054	135	N-2483 E- 776	nodular ore	65	1 42	2 16	81 28	1 18	0 10	0 026	1 20	
26	A056	51	N-2481 E- 781	do	35	13 78	19 48	61 70	0.48	0 09	0 017	28 71	Mn layer 1~1.5cm
27	A060	51	N-2481 E- 781	do	40	15 02	22 45	60 29	0 49	0 11	0 021	30.65	Mn layer 2~4cm
28	A065	51	N-2481 E- 781	layered ore nodular ore	30	13 74	20.61	67.84	0 42	0 14	0 015	32 71	Mn layer 1cm
29	A068	56	N-2482 E- 781	layered ore	40	11 44	17.32	76 61	0.38	0 09	0.016	30.11	Mn layer 1~2cm 3 beds
30	A069	56	N-2482 E- 781	do	20	8 65	12 27	80 17	0 41	0 09	0 012	21 10	Mn layer 1cm
31	A070	64	N-2482 E- 780	do	15	13.34	19.92	66 72	0.30	0 12	0 019	44 47	Mn layer 1cm
32	A071	64	N-2482 E- 780	do	20	21 71	33.77	56 49	0.33	0 05	0 029	65 79	Mn layer 2cm
33	B043	123	N-2484 E- 778	do	11	36 64	57.58	33 18	0.26	0 10	0 047	140 92	
34	B044	123	N-2484 E- 778	nodular ore	80	4 77	7.54	83.91	0 58	0 10	0 015	8 22	
35	B045	123	N-2484 E- 778	layered ore	10	54 20	82 73	3 58	0 10	0.12	0 096	542 00	
36	B078	86	N-2486 E- 779	do	7	38 83	60.35	28 40	0.22	0 07	0 057	176.50	2 beds
37	B084	142	N-2484 E- 776	do	43	10.83	15.51	76 70	0.33	0 07	0 014	32 82	
38	B085	142	N-2484 E- 776	do	26	30 17	47.22	44.65	0.30	0 07	0.029	100.57	
39	B086	142	N-2484 E- 776	nodular ore	275	0 54	0.83	84 85	1 18	0 05	0 026	0 46	
40	B091	142	N-2484 E- 776	layered ore	8	12 24	19 14	75 44	0 14	0 18	0 023	87 43	

No	Sample No	Location		Type of Ore	Sampling Width (cm)	Content of Elements							Remarks
		Outcrop No.	Co-ordination			Mn(%)	MnO_2(%)	SiO_2(%)	Fe(%)	S(%)	P(%)	Mn/Fe	
41	B092	140	N-2484 E-776	layered ore	15	13 85	21.16	71.51	0.33	0 04	0 017	41 97	
42	B095	140	N-2484 E-776	do	30	4 24	5 54	85 79	0 46	0 04	0 007	9 22	2 beds
43	B096	140	N-2484 E-776	do	19	10.51	16 56	78 48	0.32	0 06	0 018	32 84	
44	B098	140	N-2484 E-776	do	22	11 55	17 65	73 80	0.38	0 05	0 035	30 39	
45	B099	140	N-2484 E-776	do	25	34 53	53 83	31.90	0 24	0 11	0 176	143 88	
46	B100	140	N-2484 E-776	do	40	25 06	38 70	32 48	0 29	0 08	0 064	86.41	
47	B101	140	N-2484 E-776	do	72	19 92	31 62	62 79	0.32	0 06	0 041	62 25	
48	B103	133	N-2483 E-777	do	24	9 89	15 51	77.91	0 31	0 09	0 022	31.90	
49	B105	133	N-2483 E-777	do	12	17.50	27 02	66 60	0.30	0 10	0 025	58 33	
50	B106	133	N-2483 E-777	nodular ore	67	0 88	1 40	87 12	0 79	0 13	0 024	1 11	
51	B107	110	N-2485 E-778	layered ore	6	22 63	34 68	56 87	0.35	0 07	0 025	64 66	
52	B108	110	N-2485 E-778	do	11	26 63	41.94	48 75	0 49	0 13	0 044	54.35	2 beds
53	B109	110	N-2485 E-778	do	8	7 22	10 74	82 72	0 49	0 07	0 011	14 73	
54	B112	110	N-2485 E-778	do	16	15 43	23 19	70 42	0 40	0.05	0 038	38 58	
55	B113	110	N-2485 E-778	do	11	14 97	23.24	69.95	0 41	0 10	0 027	36 51	
56	B115	110	N-2485 E-778	do	19	12 87	19 43	74 81	0 34	0 07	0 017	37.85	2 beds
57	B116	110	N-2485 E-778	do	12	24.31	37 15	54 88	0 22	0 08	0 054	110 50	
58	B117	102	N-2485 E-779	do	17	10 65	15 86	76 39	0 42	0 09	0 014	25.36	3 beds
59	B120	123	N-2484 E-777	do	21	11 79	18 49	76 79	0 32	0 08	0 021	36 84	
60	B121	123	N-2484 E-777	do	25	17 81	27.96	64 29	0.35	0 13	0 027	50 89	
61	B123	123	N-2484 E-777	do	28	10.67	16 11	76 41	0.36	0 08	0 024	29 64	2 beds
62	B124	123	N-2484 E-777	do	15	3.35	4 88	89 69	0 45	0 15	0 011	7 44	
63	B125	2	N-2483 E-786	do	17	10 18	16 11	76 69	1 10	0 09	0 017	9.25	2 beds
64	B126	1	N-2483 E-786	vein	38	2 82	3.92	85 34	1 76	0 27	0 028	1 60	
65	B128	19	N-2479 E-784	layered ore	10	6 91	10 16	79 12	0 70	0 16	0 033	9 87	
66	B132	130	N-2484 E-777	do	29	21 54	33 78	57 15	0 48	0 06	0 025	44 88	2 beds
67	B136	124	N-2483 E-777	do	63	36 74	58 15	27 42	0 87	0 23	0 027	42 23	
68	B137	116	N-2485 E-777	do	43	10 06	15 68	79 08	0 44	0 07	0 017	22 86	
69	B139	116	N-2485 E-777	do	24	7 65	11 87	83 70	0 40	0 09	0 009	19 13	
70	B140	116	N-2485 E-778	do	18	14 57	23 12	71 55	0 41	0 07	0 018	35 54	3 beds
71	B141	117	N-2484 E-778	do	24	15.94	25 10	68 48	0 42	0 19	0 054	37 95	
72	B142	117	N-2484 E-778	nodular ore	130	1.98	3 00	88 11	0.67	0 08	0 013	2 96	
73	B143	117	N-2484 E-778	layered ore	13	16 08	25 46	68 03	0 35	0 10	0 021	45 94	2 beds
74	B145	117	N-2484 E-777	do	23	7 77	11 43	82 94	0.35	0 07	0 012	22.20	
75	B146	24	N-2478 E-783	do	23	15 68	24 86	50.37	1 43	0 12	0 015	10 97	
76	B147	24	N-2478 E-783	do	18	13 42	20 09	65 04	0 63	0 07	0 016	21.30	
77	B148	34	N-2479 E-782	do	11	11 58	18 05	73.97	0 72	0 12	0 018	16 08	
78	B149	34	N-2479 E-782	do	22	23 74	37 06	57 72	0 28	0 05	0.021	84 79	
79	B150	34	N-2479 E-782	do	13	11.31	17.36	68.25	0 41	0 17	0.014	27.59	
80	C005	18	N-2482 E-784	do	9	12 09	19 02	73 47	0 16	0 10	0.014	75.56	

No	Sample No	Location		Type of Ore	Sampling Width (cm)	Content of Elements							Remarks
		Outcrop No	Co-ordination			Mn(%)	MnO_2(%)	SiO_2(%)	Fe(%)	S(%)	P(%)	Mn/Fe	
81	C032	99	N-2484 E- 779	layered ore nodular ore	400	7.80	12 26	75 48	0 49	0 07	0.018	15.92	
82	C041	97	N-2484 E- 779	layered ore	50	30 64	47.63	42.33	0 27	0 15	0.083	113 48	
83	C047	114	N-2482 E- 778	do	20	13.92	21 47	70 87	0 42	0 14	0 019	33 14	
84	C048	114	N-2482 E- 778	do	20	12 51	19.31	75 55	0.33	0.22	0 019	37.91	
85	C049	114	N-2482 E- 778	do	20	8.07	12.34	80.39	0.37	0 17	0.015	21 81	
86	C051	115	N-2481 E- 777	do	150	14 80	23 14	70 02	0.33	0 16	0 032	44 85	
87	C052	115	N-2481 E- 777	do	30	24 72	38 27	54 62	0 24	0 22	0 044	103 00	
88	C053	115	N-2481 E- 777	do	120	12 79	19 31	72.95	0.30	0 17	0 025	42.63	
89	C057	93	N-2484 E- 779	do	1	9 28	14 15	72 87	0.44	0 11	0 015	21 09	
90	C063	110	N-2484 E- 779	do	100	28 12	42 95	48 07	0 26	0 11	0 046	108 15	
91	C066	110	N-2484 E- 779	do	60	13 92	21 13	72 16	0.34	0 08	0 025	40 94	upper part of C067
92	C067	110	N-2484 E- 779	do	60	13 17	20.69	71 45	0.36	0 06	0 025	36 58	upper part of C068
93	C068	110	N-2484 E- 779	do	50	10 15	14 89	73 87	0.34	0 09	0 027	29.85	
94	C072	110	N-2484 E- 779	layered ore nodular ore	100	7 15	11 11	76.63	0 84	0 16	0 046	8.51	upper part of C073
95	C073	110	N-2484 E- 779	layered ore	20	10 64	16.62	76.57	0 48	0 05	0 022	22 17	
96	C074	110	N-2484 E- 779	layered ore nodular ore	120	4 26	6 70	82 64	0 43	0 14	0 015	9 91	lower part of C073
97	C076	110	N-2484 E- 779	layered ore	40	7.99	12 28	82 03	0 15	0 09	0 014	53 27	
98	C079	110	N-2484 E- 779	do	10	6 41	9.39	83 80	0 48	0 06	0 010	13.35	
99	C088	31	N-2484 E- 782	do	13	11.33	17.36	74.80	0.55	0.13	0 012	20.60	lower part of C089
100	C089	31	N-2484 E- 782	layered ore nodular ore	50	8 18	12 12	75 48	0 90	0 07	0 015	9 09	
101	C095	9	N-2483 E- 785	layered ore	10	17.35	27 27	66 57	0.34	0 09	0 018	51 03	
102	C098	3	N-2482 E- 785	layered ore nodular ore	300	9 48	14 12	73 95	0 65	0 14	0 015	14 58	
103	C099	3	N-2482 E- 785	do	30	12.87	19.05	73 84	0.31	0 06	0 012	41 52	
104	C105	10	N-2482 E- 785	do	10	20 46	31 78	60 09	0.36	0 05	0.019	56 83	
105	C118	94	N-2484 E- 779	do	20	11.24	17 74	73 11	0.50	0 07	0 010	22 48	
106	D006	13	N-2481 E- 784	do	6	37.56	59.22	29 05	0 21	0 12	0 028	178 86	Mn layer 1cm Mn lens 5cmx20cm
107	D007	4	N-2480 E- 785	do	400	1.80	2.53	90.53	0 54	0 14	0 024	3.33	Mn layer 1~2cm
108	D012	17	N-2480 E- 784	do	30	5 02	7.95	84 71	0 47	0 05	0 017	10 68	3 beds
109	D013	17	N-2480 E- 784	do	30	3.99	6.23	88 07	0 45	0 15	0 007	8 87	
110	D014	17	N-2480 E- 784	do	30	13 97	22 02	70.52	0 43	0 12	0 032	32 49	
111	D018	42	N-2484 E- 782	do	50	8 06	12 58	75 22	1 46	0 09	0 020	5 52	Mn layer 1cm Mn lens 2.5cm
112	D020	30	N-2486 E- 782	do	10	25 73	40.35	40 43	1 66	0 09	0.047	15 50	Mn layer 1 5cm Mn lens 2cmx10cm
113	D021	30	N-2486 E- 782	do	30	15.98	25 11	66 94	0.33	0 07	0 024	48 42	
114	D022	30	N-2486 E- 782	do	30	9 10	13.68	77.31	0.33	0 07	0 020	27.58	
115	D023	30	N-2486 E- 782	do	30	15 48	24 23	66.29	0 50	0.33	0 019	30 96	
116	D024	30	N-2486 E- 782	do	30	13 11	20 78	72.02	0 48	0 21	0.023	27.31	
117	D025	30	N-2486 E- 782	do	30	7.65	12.05	77.35	0 45	0 14	0 014	17 00	
118	D026	68	N-2484 E- 780	do	50	17.34	25 80	64 83	0.30	0.28	0 021	57.80	Mn layer 1cm
119	D028	68	N-2484 E- 780	do	20	10 14	15 76	76.57	0.39	0 09	0 015	26 00	
120	D030	68	N-2484 E- 780	do	20	12.59	18.96	73 71	0.34	0 13	0 016	37 03	

No	Sample No	Location		Type of Ore	Sampling Width (cm)	Content of Elements							Remarks
		Outcrop No.	Co-ordination			Mn(%)	MnO_2(%)	SiO_2(%)	Fe(%)	S(%)	P(%)	Mn/Fe	
121	D032	68	N-2484 E-780	layered ore	70	13 07	20 04	73 06	0 40	0 13	0 027	32 68	Mn layer 1~3cm
122	D034	73	N-2483 E-780	do	90	12 61	19 83	74 12	0 23	0 09	0.013	54 83	Mn layer 1~2cm Mn lens 2cmx10cm
123	D039	95	N-2483 E-779	do	50	5 54	8 42	83 57	0.32	0 05	0 019	17.31	Mn layer 1cmx3
124	D040	95	N-2483 E-779	do	40	20 28	31 65	62.52	0 21	0.07	0 028	96 57	
125	D041	95	N-2483 E-779	do	50	17 52	27.36	55 14	0.31	0 12	0 033	56.52	
126	D042	95	N-2483 E-779	do	50	15.90	24.33	68 77	0 26	0 23	0 016	61 15	
127	D044	95	N-2483 E-779	do	20	9.01	14 12	81 03	0.35	0 11	0 009	25 74	Mn layer 1cmx4
128	D047	95	N-2483 E-779	do	60	8 28	12 77	82 13	0.32	0 09	0 015	25 88	Mn layer 1.5cm
129	D049	95	N-2483 E-779	do	70	11.51	18.22	74 42	0.31	0 14	0 022	37 13	Mn layer 1cmx3
130	D051	47	N-2484 E-781	do	70	23.38	36 71	56.57	0 21	0 14	0.036	111.33	Mn layer 1cmx3
131	D052	47	N-2484 E-781	do	50	22 86	34 55	56 90	0 22	0 07	0 032	103 91	
132	D053	47	N-2484 E-781	do	50	6 21	9 56	83 00	0.38	0 05	0 005	16.34	
133	D054	136	N-2485 E-777	do	65	18 85	29.57	65 52	0 23	0 09	0 042	81 96	Mn layer 2cm
134	D055	136	N-2485 E-777	nodular ore	500	0 73	1 07	87.84	0 94	0 10	0 019	0 78	
135	D058	136	N-2485 E-777	layered ore	50	13 58	21 15	74 54	0 33	0 05	0 023	41 15	Mn layer 2cmx3
136	D061	136	N-2484 E-776	do	80	9 80	14 55	80 37	0.36	0 04	0 012	27 22	Mn layer 1cmx2
137	D063	136	N-2484 E-776	do	110	3 64	5 56	77.01	0.39	0 07	0 006	9.33	Mn layer 3cmx3 2 beds
138	D066	136	N-2484 E-776	nodular ore	1200	0 62	0 78	86.34	0 73	0 10	0 015	0 85	
139	D067	136	N-2484 E-776	layered ore	40	9 02	14 05	83 98	0.33	0 09	0 010	27.33	
140	D069	143	N-2485 E-775	do	80	7 80	12 16	81 70	0 85	0 09	0 011	9 18	Mn layer 1cmx2
141	D070	14	N-2483 E-784	do	50	4 85	7.57	86.36	0.37	0 08	0 005	13 11	Mn layer 1cmx3
142	D072	14	N-2483 E-784	do	40	14 23	21 93	72 68	0 29	0 12	0 012	49 07	Mn layer 1cmx2
143	F050	38	N-2483 E-782	do	50	13.39	18 00	71.36	0 50	0 11	0 014	26 78	
144	F051	33	N-2483 E-782	do	25	11 81	18 08	74 09	0 25	0 05	0 015	47 24	Mn layer 1 5cmx3
145	F052	33	N-2483 E-782	do	60	14 09	22 12	69 81	0 23	0.30	0 013	61.26	
146	F053	33	N-2483 E-782	do	15	17.99	26.39	66 06	0 31	0 14	0 013	58 03	Mn layer 1cm
147	F054	33	N-2483 E-782	do	30	10.34	15 81	76 74	0 36	0 21	0 013	28 72	Mn layer 1cmx3
148	F055	40	N-2483 E-782	nodular ore	5	12 05	17 65	76 19	0.35	0 18	0 008	34 43	Mn lens 1cmx2
149	F056	69	N-2481 E-780	layered ore	140	12 40	17.30	73 60	0 31	0 41	0 071	40.00	
150	F057	69	N-2481 E-780	do	60	13 19	19 66	72.38	0.31	0 18	0 020	42.55	40cm bed 20cm bed
151	F058	69	N-2481 E-780	do	80	9.37	13 81	78 48	0.38	0 14	0 015	24.66	70cm bed 10cm bed
152	F060	69	N-2481 E-780	do	45	12 03	17.39	73 58	0.33	0 20	0.019	34 45	30cm bed 15cm bed
153	F061	69	N-2481 E-780	do	20	6 73	10 40	84.39	0 33	0 22	0.009	20.39	10cm bed 10cm bed
154	F062	67	N-2482 E-780	do	20	51 41	81.27	7 67	0 21	0 13	0.088	244 81	
155	F063	71	N-2481 E-780	do	50	16 75	24 54	64 19	0 41	0 13	0.016	40 85	
156	F064	71	N-2481 E-780	do	30	25 65	40 62	53 73	0 22	0 10	0.047	116 59	
157	F065	71	N-2481 E-780	do	50	8 63	12 93	78 16	0.30	0 10	0.019	28 77	
158	F066	71	N-2481 E-780	do	50	13.36	20 27	72 29	0 26	0 12	0 020	51.38	
159	F067	71	N-2481 E-780	do	30	8 42	13 13	78 48	0 56	0.20	0 018	15 04	
160	F068	71	N-2481 E-780	do	5	15 52	24.31	69 86	0.37	0 09	0 010	41 95	

No	Sample No	Location		Type of Ore	Sampling Width (cm)	Content of Elements							Remarks
		Outcrop No	Co-ordination			Mn(%)	MnO_2(%)	SiO_2(%)	Fe(%)	S(%)	P(%)	Mn/Fe	
161	F070	74	N-2481 E- 779	layered ore	65	12 92	19.66	74 44	0 37	0 15	0 021	34 92	
162	F071	75	N-2481 E- 779	do	50	18 14	23.33	62 17	0.32	0 16	0 018	56 69	Mn layer 1cmx6
163	F074	72	N-2481 E- 780	do	50	15.47	23 15	67 41	0.31	0 18	0 020	49 90	
164	F075	72	N-2481 E- 780	do	40	30 27	46.91	43.09	0 26	0 16	0 033	116 42	
165	F076	72	N-2481 E- 780	do	30	14.35	22 01	69 61	0.32	0 10	0 017	44 84	
166	F077	76	N-2481 E- 780	do	90	1J 12	15 43	76 67	0 32	0 15	0 011	34 75	Mn layer 1cm 50cm bed 40cm bed
167	F078	76	N-2481 E- 780	do	25	7.19	11 09	82 22	0 39	0 19	0 009	18 44	Mn layer 1cmx2
168	F079	76	N-2481 E- 780	do	50	4 26	6 64	83 23	0.56	0 21	0 017	7 61	30cm bed 20cm bed
169	F080	76	N-2481 E- 780	do	25	10 14	15 11	78.37	0.29	0 14	0 021	34 97	
170	F081	76	N-2481 E- 780	do	35	11.25	17 21	76 46	0 24	0 24	0 016	46 88	Mn layer 1cm
171	F082	83	N-2481 E- 779	do	122	19 54	30 22	62 17	0 24	0 14	0 072	81 42	100cm bed 10cm bed 10cm bed 2cm bed
172	F083	83	N-2481 E- 779	do	100	14 13	19.92	71 03	0 29	0 11	0 034	48 72	80cm bed 20cm bed
173	F084	84	N-2481 E- 779	do	140	7 26	9.95	81 45	0.31	0 15	0 043	23 42	
174	F085	84	N-2481 E- 779	do	70	20 83	32 24	60 77	0 24	0 16	0 050	86 79	
175	F086	81	N-2481 E- 779	do	50	15 77	24 73	68 08	0 29	0 07	0 034	54 38	10cm bed 40cm bed
176	F087	81	N-2481 E- 779	do	40	11.32	17 03	74 13	0 29	0 07	0 022	39 03	20cm bed 20cm bed
177	F088	110	N-2485 E- 778	do	60	10 65	16 68	76 07	0 43	0 13	0 024	24 77	30cm bed 20cm bed 10cm bed
178	F089	110	N-2485 E- 778	do	45	14 81	22 45	69 15	0.34	0 14	0 058	43 56	
179	F090	110	N-2485 E- 778	do	40	11 48	16.60	75 18	0.36	0 10	0 020	31 89	Mn layer 1 cmx2
180	F091	110	N-2485 E- 778	do	35	15.85	24 55	68 10	0 89	0 09	0 020	17.81	15cm bed 10cm bed 10cm bed
181	F092	110	N-2485 E- 778	do	45	9 47	14.50	79.35	0 29	0 15	0 012	32 66	10cm bed 15cm bed 20cm bed
182	F093	110	N-2485 E- 778	do	50	7.22	10 60	76 65	0 45	0 09	0 020	16.04	30cm bed 20cm bed
183	F094	110	N-2485 E- 778	do	50	9 79	14 40	79.55	0.31	0 08	0 021	31 58	
184	F095	110	N-2485 E- 778	do	75	16 94	26 69	65 50	0.37	0 10	0 035	45 78	Mn layer 1cm
185	F096	112	N-2486 E- 778	do	20	3.25	5 03	89 29	0.53	0 05	0 018	6 13	
186	F097	128	N-2486 E- 777	do	45	16 50	24 28	65 19	0 48	0 10	0 025	34.38	15cm bed 30cm bed
187	F098	128	N-2486 E- 777	do	65	10 53	15 55	77.30	0 42	0 09	0 014	25 07	10cm bed 55cm bed Mn layer 1cm
188	F099	128	N-2486 E- 777	do	35	6 91	10 82	80 92	0 47	0 11	0 025	14 70	Mn layer 1cmx3
189	F100	126	N-2488 E- 777	do	90	8.81	12 41	79 59	0 47	0 03	0 019	18 74	40cm bed 50cm bed
190	F101	126	N-2488 E- 777	do	130	26 02	37.57	51 81	0.32	0 05	0 050	81.31	30cm bed 100cm bed
191	F103	125	N-2488 E- 777	do	75	31 17	48 92	41.07	0.32	0 07	0 057	97 41	50cm bed 25cm bed
192	E003	153	N-2465 E- 775	do	15	37 98	59 43	27.20	0 22	0 15	0 036	172 64	
193	E007	151	N-2475 E- 780	do	200	40 62	63 59	22 24	0 12	0 08	0 034	338 50	Mn layer 50 cmx2
194	E019	148	N-2480 E- 765	do	40	36 45	56.31	31.27	0 14	0 25	0 067	260.36	
195	E023	145	N-2485 E- 770	do	30	25.07	39 66	48 49	0 28	0 16	0 031	89.54	
196	E026	158	N-2460 E- 760	nodular ore	400	17.36	26 80	49.95	0 18	0 08	0 008	96 44	
197	E027	159	N-2460 E- 760	layered ore	900	16 63	25 86	62 17	0 19	0 17	0 014	87.53	
198	E028	154	N-2465 E- 755	do	100	16 24	25.51	66 15	0 23	0 10	0 034	70.61	
199	E030	144	N-2490 E- 770	do	200	23 13	34 59	53 83	0 15	0 04	0.058	154 20	

Table Result of Chemical Analysis

(6)

No	Sample No	Location		Type of Ore	Sampling Width (cm)	Content of Elements							Remarks
		Outcrop No.	Co-ordination			Mn(%)	MnO_2(%)	SiO_2(%)	Fe(%)	S(%)	P(%)	Mn/Fe	
200	E037	160	N-2455 E- 770	layered ore	400	37 77	60.62	27.06	0 24	0 17	0 017	157.38	200cm bed 200cm bed
201	E059	162	N-2440 E- 760	do	35	41.36	67.24	20 58	0 17	0 12	0 066	243 29	
202	E067	163	N-2445 E- 755	do	30	45 07	71.04	4.31	0 13	0.06	0 083	346 69	
203	E076	161	N-2450 E- 765	do	250	8 77	13 08	77.02	0.39	0 15	0 012	22 49	Mn layer 1cm
204	E078	159	N-2455 E- 760	do	200	19 71	32.34	57.50	0.35	0 14	0 022	56.31	Mn layer 1cm
205	E089	167	N-2435 E- 750	do	80	23 73	36 66	53 13	0.35	0 20	0 036	67 80	40cm bed 40cm bed
206	E091	164	N-2440 E- 745	do	150	22 02	33 05	54.23	0.31	0 06	0 025	71.03	

Table A-7 Result of Spectrographic Analysis

(1)

No	Sample No.	Location		Density in Emission Spectrography																										Remarks
		Outcrop No.	Co-ordination	Mn	Fe	P	V	Cr	Co	Ni	Cu	Mo	W	Pb	Sr	Zn	Ti	Ga	Ge	Ba	B	Ag	Sn	Si	Al	Mg	Ca	Na	K	
1	B045	123	N-2484 E-778	0 93	0 83	0 03	0.24	0 01	0 85	0 12	1 37	1 32	0 00	0 23	1 35	1 17	0 15	0 40	0 23	2 00	0 85	0.75	0.03	0 07	0 27	0 20	1 22	0 98	0 61	
2	B108	110	N-2485 E-778	1 32	1 00	0 14	0.30	0.32	2 00	0 72	1 45	1.10	0 03	0 40	0.94	0.65	0 22	1.90	0 39	1.50	1 15	1.41	0.30	0.17	0 78	0.34	1 05	1 15	0.64	
3	B112	110	N-2485 E-778	1 52	1.18	0.32	0 56	1 35	1.20	0 56	1 67	1.30	0 04	0 55	0.75	0 75	0 23	0 31	0 34	1.30	1 63	0.75	0 28	0.83	0 17	0.25	0 52	0.24	0.03	
4	B116	110	N-2485 E-778	1.39	1.12	0 25	0 34	0 55	2 00	0 97	1.45	1 34	0 02	0 70	1 05	0.77	0 17	1 68	0.60	1 25	1.35	1 55	0.36	0.32	0.28	0 33	0 99	0 87	0 32	
5	B120	123	N-2484 E-777	1 39	1 04	0 15	0 37	1.23	1 67	0 48	1 72	1.22	0.10	0 43	1.17	0 63	0 17	0 19	0 26	1.75	1.70	0 60	0.24	0 83	0 04	0 08	0 39	0.13	0.02	
6	B123	123	N-2484 E-777	1 14	0 76	0 24	0.74	1.33	1 49	0 32	1 55	0 93	0.13	0 15	0 84	0.65	0.25	0.34	0 19	1.86	1 57	0 37	0.26	0.67	0 16	0.06	0 49	0.38	0 20	
7	C063	110	N-2484 E-779	1 55	1 26	0.33	0 48	0 57	2 00	1 34	1.35	1 19	0 02	0 42	1 07	1 27	0.19	1 41	0.59	1 56	1 49	0 65	0.46	0 25	0 20	0 33	0 97	0 85	0.44	
8	C064	110	N-2484 E-779	1 20	0 83	0 35	0.75	1 20	1 37	0 69	1.42	1.16	0 04	1 05	1.12	1 23	0 18	0.21	0.35	1.80	1.60	0 51	0 17	0.55	0 21	0.12	0.70	0 25	0 11	
9	C072	110	N-2484 E-779	0 95	0 83	0 36	0 63	0 70	1.35	0 33	1 40	0 83	0 05	0 31	0 87	0.70	0 67	0 45	0 11	1 75	1.40	0 27	0.07	0.77	0 85	0 34	0.69	0 45	0 23	upper part of C073
10	C073	110	N-2484 E-779	1 16	0 75	0.16	0 63	1 25	1 35	0 38	1 47	0 92	0 06	0 14	1.20	0 59	0 18	0.22	0 14	1.94	1.44	0.43	0 21	0.70	0 13	0.10	0.35	0.27	0.07	
11	C074	110	N-2484 E-779	0.95	0 25	0.09	0 43	0 61	1 25	0.30	1 35	0 42	0.05	0 28	0 34	0.30	0 60	0.65	0 07	0.47	1.17	0.35	0.05	0.88	0 50	0 42	0.32	0.31	0.06	lower part of C073
12	C079	110	N-2484 E-779	0.97	0 75	0 05	0.49	1.19	1 57	0 43	1 22	0.75	0 02	0 12	0 85	0.51	0 26	0 17	0 08	1 60	1 37	0.35	0 19	0 82	0.52	0.15	0.48	0.19	0.03	black chert
13	C083	32	N-2484 E-782	0.10	1 49	0.54	0 56	0 07	1 69	0 37	1 10	1.25	0 03	0 95	1 55	1 23	0 79	2.00	0 98	0.73	1 48	0 23	0 84	0.15	2 00	0.57	2 00	0 79	0.47	goethite
14	C088	31	N-2484 E-782	1 33	1 04	0 15	0 49	1 20	1.29	0.69	1 50	1 13	0 05	0 83	0 70	0 95	0 43	0 38	0 30	1 87	1.70	0 61	0 20	0 90	0 38	0 25	0 52	0.30	0 04	lower part of C089
15	C089	31	N-2484 E-782	1 03	0 85	0 08	0 30	0 52	1 06	0 34	1 27	0 63	0 02	0 32	0.60	0 45	0 74	0 50	0 08	0 89	1 45	0.27	0 04	0 60	0 79	0 29	0 65	0 28	0.07	
16	C098	3	N-2482 E-785	1 07	0 70	0 07	0 33	0 67	0 49	0 21	0 87	0 87	0 00	0 33	1 93	0.27	0 67	0 40	0 06	0 85	1 32	0 35	0.08	0 55	0 80	0 39	0 77	0 44	0 12	
17	C099	3	N-2482 E-785	1 25	0 85	0.07	0 43	1 19	1 55	0 54	1.38	0 90	0 02	0 17	0 70	0.67	0 25	0 12	0 17	1 50	1 55	0 50	0 20	0 70	0 14	0 07	0 39	0 10	0.02	
18	C123	94	N-2484 E-779	0 01	0.67	0 13	0 14	0 86	0 60	0 24	0 70	0 12	0 00	0 12	0 14	0 10	0 65	0 39	0 07	0 05	1.27	0 10	0 09	1 13	0 34	0 29	0 29	0 55	0 06	red chert, laminated upper part of black ch
19	C124	94	N-2484 E-779	0 34	1 07	0 20	0 29	0 60	0 65	0.38	1 15	0 27	0 01	0 20	0 14	0 24	1.15	0 99	0 14	0 00	1 30	0 45	0 07	1 20	1 01	0 57	0.47	0 60	0 10	lower part of C123
20	D012	17	N-2480 E-784	1.15	0 93	0 18	0 39	1 39	0 73	0 57	1.12	0 87	0 02	0 28	0 57	0 48	0 47	0 31	0.22	0 57	1 67	0.47	0 28	1.15	0 23	0 22	0.99	0 48	0 01	
21	D013	17	N-2480 E-784	1.15	0 94	0 08	0 24	1 29	0 40	0 37	1.60	0 78	0 01	0 81	0 70	0 14	0 26	0 34	0 20	2 00	1 55	0.35	0.23	1.13	0 31	0 12	0.17	0.23	0.02	
22	D033	–	N-2483 E-780	0 15	1.36	0 14	0 73	1 20	0 29	0 26	1 20	0 60	0 02	0 17	0 14	0 13	0 80	0 37	0 16	0.43	1.34	0 11	0 16	1.20	0 45	0 07	0 37	0 43	0.02	yellow chert
23	D039	95	N-2483 E-779	1 37	1 10	0 18	0 75	1 48	1.18	0 71	1 19	0 89	0 00	0 15	1.03	0 56	0.20	0 16	0 42	1.87	1.83	0 57	0 24	1 26	0 03	0 07	0.43	0.25	0 07	
24	D042	95	N-2483 E-779	1 17	0 76	0 09	0.53	1 29	0.70	0 39	1 38	1 03	0 02	0 10	0 72	0.62	0.10	0 18	0.17	1.25	1.58	0 48	0.18	0 56	0 09	0 07	0 52	0 14	0 06	
25	D054	136	N-2485 E-777	1.39	1 01	0.38	0 76	1.25	0 73	0 63	1.40	1.46	0 01	0 14	1 40	1 10	0 20	0.13	0 43	1 95	1.70	0 83	0 25	0 68	0 15	0 10	0 74	0 25	0 15	

No.	Sample No	Location		Density in Emission Spectrograph																										Remarks
		Outcrop No.	Co-ordination	Mn	Fe	P	V	Cr	Co	Ni	Cu	Mo	W	Pb	Sr	Zn	Ti	Ga	Ge	Ba	B	Ag	Sn	Si	Al	Mg	Ca	Na	K	
26	D063	136	N−2484 E−776	1 10	0 87	0 09	0 51	1 33	1 15	0 52	0.95	0 75	0 00	0 13	0 51	0 23	0 17	0 16	0 16	1 47	1 63	0 40	0 26	1 25	0 10	0 08	0 15	0 19	0 03	
27	F001−1	–	N−2481 E−782	0 19	1 00	0 20	0 29	1 64	0 34	0 47	1 10	0 23	0 00	0 18	0 17	0 20	0 60	0 50	0 17	0 12	1 65	0 13	0 47	1 53	0 33	0 23	0 23	0 66	0 03	red chert
28	F049	126	N−2488 E−777	0 93	0 77	0 06	0 16	1 34	1 18	0 29	1 15	0 33	0 00	0 07	0 50	0 08	0 18	0 07	0 11	1 37	1 58	0 27	0 22	1 22	0 13	0 22	0 17	0.17	0 02	
29	F056	69	N−2481 E−780	1 30	0 95	0 55	0 74	1 40	1 05	0 63	1 70	1 07	0 07	0 03	0 82	0 93	0 20	0 19	0 30	1 92	1 75	0 60	0 29	1 20	0 14	0 18	0 83	0 20	0 08	
30	F064	71	N−2481 E−780	1 61	1 40	0 52	0 56	0 80	1 99	0 83	1 65	1 54	0 09	0 67	1 30	1 73	0 21	1 34	0 81	1.45	1 71	1 83	0 64	0 68	0 14	0 48	0 93	1 25	0.54	
31	F066	71	N−2481 E−780	1 27	1.13	0 44	0 96	1.48	1 28	0 79	1 67	1 18	0 07	0 60	1 26	1 18	0 28	0 31	0 25	1 98	1 85	0 63	0 41	1 02	0 25	0 13	0 82	0.26	0 26	
32	F078	76	N−2481 E−780	1 39	1 21	0 27	0 81	1 28	1 70	0 85	1 67	0 79	0 09	0 62	0 65	0 83	0 40	0 42	0 25	1 10	1 87	0 70	0 34	1 48	0 35	0 39	0 69	0 55	0.06	
33	F091	110	N−2485 E−778	1 42	1 21	0 30	0 81	1 31	0 94	0 47	1 65	1 48	0 02	0 61	1 19	1 03	0 28	0 23	0 41	1 84	1 85	0 65	0 33	0 90	0 24	0 17	1 07	0 33	0 14	
34	F092	110	N−2485 E−778	1 17	0 85	0 11	0 69	1 20	0 79	0 72	1 53	1.13	0 15	0 61	1 04	0 75	0 24	0 45	0 19	1 33	1 68	0 60	0 24	0 95	0 30	0 15	0 70	0 22	0 02	
35	F095	110	N−2485 E−778	1 03	0 77	0 02	0 88	1 00	0 65	0 77	1 35	1 53	0.16	0 33	1 25	1 27	0 34	0 61	0 38	1 70	1 58	0 68	0 14	0 46	0 40	0 12	0 92	0 43	0 20	
36	E003	153	N−2465 E−775	1 60	1.57	0 34	0 44	0 23	1 00	1 14	1 54	1 07	0 00	0 63	1 73	2 00	0 40	1 47	0 83	1 53	1 23	1 89	0.68	0.06	0 33	0 53	1 43	1 02	0 34	
37	E007	151	N−2475 E−780	1.48	1 35	0 16	0 33	0 14	0 55	0 94	1 40	1 61	0 00	0 20	1 53	1 80	0 33	0 92	1 04	1 61	1 27	1 53	0 35	0 01	0 11	0 27	0 84	1 07	0 52	
38	E019	148	N−2480 E−765	1 51	1 47	0 22	0 37	0 18	0 70	0 33	1 01	1.35	0 00	0 35	1 26	1 17	0 39	0 59	0 79	1 93	1 05	1 75	0 53	0 03	0 09	0 26	1 69	1.10	0 71	
39	E023	145	N−2485 E−770	0 99	0 73	0 03	0 37	0 67	1.17	0 63	0 98	1 43	0 00	0 09	1 67	0 97	0 23	1 31	0 15	1 96	1 35	1 07	0 15	0 17	0.24	0.24	1.50	1 57	1 26	
40	E026	158	N−2460 E−760	1 04	0 83	0 03	0.78	1 43	0 64	0 47	0 85	0 65	0 02	0 05	0 64	1 00	0 23	0 21	0 21	1 76	1 70	0 53	0 30	0 85	0 09	0 10	1.59	0 36	0 02	
41	E027	159	N−2460 E−760	1.36	1 24	0.14	0.62	0.74	1 28	1.12	1 68	1.34	0 02	0 27	1.32	1 37	0 27	1 33	0 36	2 00	1.52	1 57	0 37	0 53	0 34	0.33	1.82	1 11	0.18	
42	E028	154	N−2465 E−755	1 32	1.27	0 14	1 01	1 32	0 45	0 77	1.68	1 47	0 07	0.24	1 03	1 48	0 37	0 45	0 54	1.10	1 74	0.80	0 32	0 95	0.22	0 08	1 17	0 36	0.06	
43	E030	144	N−2490 E−770	1 33	1 23	0 15	0.36	0 54	1 95	1 20	1 03	1 33	0 00	0 25	1 00	1 60	0 20	0 51	0 35	1 81	0 90	1.75	0.43	0 47	0.03	0 19	1 64	1.05	0 41	
44	E037	160	N−2455 E−770	1.62	1 61	0 34	0 37	0 17	1 21	0 18	1 71	0 40	0 02	0 55	1 60	1 88	0 42	1 98	0 52	2 00	0.75	1 95	0 64	0 33	0 64	0 41	1.10	0.90	0 49	
45	E059	162	N−2440 E−760	1 41	1 33	0 15	0 52	0 22	1.82	0 96	1 60	1 16	0 00	0 40	1 24	1 70	0 39	1.06	0 53	1 95	1 00	1 98	0.56	0 13	0 13	0.25	0 90	2.29	0.47	
46	E067	163	N−2440 E−755	0 69	0 67	0 01	0.17	0 04	0 14	0 06	0 75	1 81	0 00	0 05	1 88	1.34	0 43	0 00	0 08	2 00	0 93	0 60	0 00	0 02	0 32	0 06	1.47	1.51	1 30	
47	E076	161	N−2450 E−765	0.34	1 24	0.25	0 46	1.17	1 25	0 63	1 63	1.11	0 03	0 20	1 67	0 94	0 57	0 27	0 29	2 00	1 58	0.95	0 28	1 27	0 21	0.24	1.17	0 55	0.03	
48	E078	159	N−2455 E−760	0 45	1 35	0.29	0.63	0 39	1 90	1.12	1 78	1 32	0 44	0 65	1 64	1 34	0 48	1 91	0 44	2 00	1 43	1 85	0 48	0.50	0.91	0.44	1 72	1.29	0.54	
49	E089	167	N−2435 E−750	0 46	1 39	0 41	0 67	0 76	1 86	1 53	1 70	1 71	0 08	0 60	1 46	1 66	0 44	1 69	0 65	1 35	1 68	1 85	0 50	0 64	0.49	0 44	1.60	1.42	0.33	
50	E091	164	N−2440 E−745	1 06	0 84	0.09	0 34	0.51	1 83	0 65	1 15	1.19	0 00	0 17	1 87	0 90	0 22	1.66	0 11	1.87	1 13	1.38	0 21	0.22	0 49	0 24	1.69	1 33	0.75	

Table A-8 Relation between Density in Emission Spectrography and Content of 7 Minor Elements

(1)

No.	Sample No.	Location		Elements														Remarks
				Cr		Co		Ni		Cu		Mo		Pb		Zn		
		Outcrop No.	Co-ordination	D	contents (ppm)	D	contents (ppm)	D	contents (ppm)	D	contents (ppm)	D	contents (ppm)	D	contents (ppm)	D	contents (ppm)	
1	B045	123	N-2484 E-778	0.01	5	0 85	39	0.12	15	1.37	107	1.32	97	0.23	60	1.17	96	
2	B108	110	N-2485 E-778	0 32	142	2.00	91	0.72	89	1.45	113	1.10	81	0 40	106	0 65	53	
3	B112	110	N-2485 E-778	1 35	596	1 20	54	0 56	69	1 67	130	1.30	95	0.55	145	0 75	61	
4	B116	110	N-2485 E-778	0 55	243	2 00	91	0.97	120	1 45	113	1.34	98	0.70	185	0.77	63	
5	B120	123	N-2484 E-777	1.23	544	1.67	76	0.48	60	1 72	134	1.22	89	0 43	113	0.63	52	
6	B123	123	N-2484 E-777	1 33	588	1.49	68	0.32	40	1.55	121	0.93	68	0.15	39	0 65	53	
7	C063	110	N-2484 E-779	0 57	252	2.00	91	1.34	166	1.35	106	1.19	87	0.42	110	1.27	104	
8	C064	110	N-2484 E-779	1.20	530	1.37	62	0 69	86	1 42	111	1 16	85	1.05	277	1.23	101	
9	C072	110	N-2484 E-779	0 70	310	1.35	61	0.33	41	1 40	109	0 83	61	0.31	82	0.70	57	upper part of C073
10	C073	110	N-2484 E-779	1.25	552	1 35	61	0.38	47	1.47	115	0 92	67	0 14	37	0.59	48	
11	C074	110	N-2484 E-779	0 61	270	1.25	57	0.30	37	1.35	106	0 42	31	0.18	47	0.30	25	lower part of C073
12	C079	110	N-2484 E-779	1.19	526	1 57	71	0 43	53	1.22	95	0.75	55	0.12	31	0 51	42	
13	C083	32	N-2484 E-782	0 07	31	1.69	77	0.37	46	1.10	86	1.25	91	0.95	250	1 23	101	goethite
14	C088	31	N-2484 E-782	1.20	530	1.29	58	0.69	86	1 50	117	1 13	83	0 83	219	0.95	78	lower part of C089
15	C089	31	N-2484 E-782	0 52	230	1 06	48	0 34	42	1.27	99	0 63	46	0.32	84	0.45	37	
16	C098	3	N-2482 E-785	0 67	296	0 49	22	0 21	26	0.87	68	0.87	64	0.33	87	0 27	22	
17	C099	3	N-2482 E-785	1 19	526	1 55	70	0 54	67	1.38	108	0.90	66	0 17	44	0.67	55	
18	D012	17	N-2480 E-784	1 39	614	0 73	33	0 57	71	1 12	88	0 87	64	0.28	74	0.48	39	
19	D013	17	N-2480 E-784	1.29	570	0 40	18	0.37	46	1.60	125	0 78	57	0.81	214	0.14	11	
20	D039	95	N-2483 E-779	1 48	653	1 18	54	0 71	88	1 19	93	0 89	65	0.15	39	0.56	46	
21	D042	95	N-2483 E-779	1 29	570	0 70	32	0.39	48	1.38	108	1.03	76	0 10	26	0 62	51	
22	D054	136	N-2485 E-777	1.25	552	0 73	33	0.63	78	1 40	109	1 46	107	0.14	37	1 10	90	
23	D063	136	N-2484 E-776	1.33	588	1.15	52	0 52	65	0.95	74	0 75	55	0.13	34	0.23	19	
24	F056	69	N-2481 E-780	1 40	618	1 05	48	0 63	78	1.70	133	1.07	78	0.30	79	0.93	76	
25	F064	71	N-2481 E-780	0 80	354	1 99	90	0.83	103	1 65	129	1.54	112	0 67	176	1.73	142	

(2)

No	Sample No	Location		Elements														Remarks
				Cr		Co		Ni		Cu		Mo		Pb		Zn		
		Outcrop No	Co-ordination	D	contents (ppm)	D	contents (ppm)	D	contents (ppm)	D	contents (ppm)	D	contents (ppm)	D	contents (ppm)	D	contents (ppm)	
26	F066	71	N-2481 E-780	1 48	653	1 28	58	0 79	98	1 67	130	1 18	86	0 60	158	1 18	96	
27	F078	76	N-2481 E-780	1 28	566	1 70	77	0 85	105	1 67	130	0 79	58	0 62	163	0 83	68	
28	F091	110	N-2485 E-778	1 31	579	0 94	43	0 47	59	1 65	129	1 48	108	0.61	161	1.03	84	
29	F092	110	N-2485 E-778	1.20	530	0 79	36	0 72	89	1.53	120	1.13	83	0 61	161	0.75	61	
30	F095	110	N-2485 E-778	1 00	442	0 65	30	0 77	95	1 35	106	1.53	112	0 33	87	1.27	104	
31	E003	153	N-2465 E-775	0 23	102	1 00	45	1 14	141	1 54	120	1 07	78	0 63	166	2 00	163	
32	E007	151	N-2475 E-780	0 14	62	0 55	25	0 94	116	1 40	109	1.61	118	0 20	53	1 80	147	
33	E019	148	N-2480 E-765	0 18	80	0 70	32	0 33	41	1 01	79	1.35	99	0 35	92	1 17	96	
34	E023	145	N-2485 E-770	0 67	296	1 17	53	0 63	78	0 98	77	1 43	104	0 09	24	0 97	79	
35	E026	158	N-2460 E-760	1.43	632	0 64	29	0 47	59	0 85	67	0 65	48	0 05	12	1.00	82	
36	E027	159	N-2460 E-760	0.74	327	1.28	58	1.12	139	1 68	131	1 34	98	0 27	71	1.37	112	
37	E028	154	N-2465 E-755	1 32	583	0 45	21	0 77	95	1 68	131	1 47	107	0 24	63	1.48	121	
38	E030	144	N-2490 E-770	0 54	239	1.95	88	1 20	149	1 03	81	1.33	97	0.25	66	1 60	131	
39	E037	160	N-2455 E-770	0 17	76	1 21	55	0 18	22	1 71	134	0 40	30	0.55	145	1.88	154	
40	E059	162	N-2440 E-760	0 22	98	1 82	82	0 96	119	1 60	125	1 16	85	0.40	106	1.70	139	
41	E067	163	N-2445 E-755	0.04	18	0 14	6	0 06	7	0.75	59	1 81	132	0.05	12	1.34	110	
42	E076	161	N-2450 E-765	1.17	517	1 25	57	0 63	78	1 63	127	1 11	81	0 20	53	0.94	77	
43	E078	159	N-2455 E-760	0.39	173	1.90	86	1.12	139	1.78	139	1 32	97	0 65	172	1.34	110	
44	E089	167	N-2435 E-750	0 76	336	1 86	84	1 53	90	1.70	133	1 71	125	0 60	158	1 66	136	
45	E091	164	N-2440 E-745	0 51	226	1 83	83	0 65	81	1 15	90	1 19	87	0 17	44	0.90	74	
46	C123	94	N-2484 E-779	0 86	381	0 60	27	0 24	30	0 70	55	0 12	9	0 12	31	0.10	8	red chert, laminated upper part of layered ore
47	C124	94	N-2484 E-779	0 60	265	0 65	30	0 38	47	1.15	90	0.27	20	0.20	53	0.24	20	pale brown chert lower part of C123
48	D033	–	N-2483 E-780	1.20	530	0.29	13	0 26	32	1 20	94	0 60	44	0 17	44	0.13	11	yellow chert
49	F001	–	N-2481 E-782	1.64	723	0.34	16	0.47	59	1 10	86	0 23	17	0.18	47	0.20	16	red chert
50	F049	126	N-2488 E-777	1.34	592	1.18	54	0 29	36	1.15	90	0.33	25	0.07	8	0.08	6	layered ore (silliceou part)