第２章　第２年次調査への提言

（1）サウトバイ・ブルグット鉱床については、当面の採掘対象となるNo.1鉱体の地表下300m付近をターゲットとしてボーリング調査を実施して鉱量増を図る。

また、サウトバイ鉱床の北西部に隣接するサゲンカン鉱床（W）については、既に探鉱が終了しており、資料収集・解析を行って、鉱量評価を実施することが望ましい。

最終年度には鉱量評価を行って、露天堀及び坑内堀による開発可能性の検討の為にサウトバイ・ブルグット・サゲンカン鉱床を対象とした採鉱開発計画(Pre F/S)を策定することが望ましい。

（2）ブルトカン鉱徴地については、既に金濃集部が確認されている鉱体の形状、構造及び鉱物組成と深度70m以下への連続性を明らかにし、将来の探鉱に資するためにボーリングを実施することが望ましい。

また、ブルトカン鉱徴地については、過去の地質調査によって角礫化、酸化鉄化した４条の珪化交代変成岩を含むゾーンが延長4.5kmにわたって連続することが推定されているが、地表部が砂礫で被覆されているために、その全体像は明らかでない。鉱化作用の水平、垂直方向の広がりを明らかにするためにトレンチと物理探査を実施することが望ましい。

（3）本年度衛星画像解析により抽出された変質帯17箇所の内、4箇所がサウトバイ－ブルトカン地区に、5箇所がオクジェトペス地区に分布している。これらの変質帯は、高硫化物タイプの金鉱化作用に関連した変質帯を反映している可能性がある。従って、これらの地区での鉱化のポテンシャルを確認するためにチェック調査を実施することが望ましい。

COLLECTED DATA

Collected Data

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APPENDICES

Ap. 1 List of Rock Samples(1)

Sample No.	Field Name	Locality	Remarks	Rock		
				W.A	T	X
FR-2	Lamprophyre	Bulutkan	float(Mid.Perm)	○	○	
FR-3	Quartz syenite	Bulutkan	float(Late Carb.-Early Perm.)	○	○	
FR-4	Granodiorite	Burgut	core(No.673,45m)	○		
FR-7	Granite	South Turbay	trench waste	○		
FR-8	Granodiorite	South Turbay	trench waste	○	○	
FR-9	Granodiorite	North Turbay	trench waste	○		
FR-12	Granosyenite	Okjetpes	trench waste	○		
FR-13	Granodiorite porphyry	Okjetpes 42° 03. 01' N 64° 05. 89' E	outcrop	○	○	
FR-14	Microdiorite	Okjetpes	shaft waste	○		
FR-16	Quartz diorite porphyry	Barhanny	trench waste(Pre. ore)	○	○	
FR-17	Granodiorite	Barhanny 42° 02' 24"N 64° 09' 56"E	trench waste	○		
FR-18	Two mica granite	Djylandy 42° 10. 45' N 63° 42. 82' E	outcrop(Oltyntau intrusive, Late Carb. - Perm.)	○		
FR-19	Aplite(pegmatitic)	Djylandy	core(No.2)	○		
FR-20	Quartz diorite	Djylandy	core(No.2)	○		
FR-22	Microgranite	Sarytau	shaft waste	○		
FR-23	Granodiorite	Sarytau 42° 09' 16"N 64° 18' 14"E	shaft waste	○	○	
FR-25	Microgranite	Sarytau	outcrop(dyke) EW75-80N, W=3m	○		
FR-27	Lamprophyre	Okjetpes	core(CKB-57,150m)	○	○	
FR-29	Lamprophyre	Okjetpes	core(CKB-60,39.0m)	○	○	
FR-30	Diorite	Okjetpes	core(CKB-94,45.0m)	○		
FR-31	Granite	Sautbay	core(CKB-26,145m)	○		
FR-32	Granite porphyry	Sautbay	core(CKB-26,215m)	○		
FR-33	Aplite	Sautbay	core(CKB-26,362m)	○		
FR-34	Granite porphyry	Saghinkan	core(CKB-258,72m)	○		
FR-35	Aplite	Saghinkan	core(CKB-258,84m)	○	○	
FR-36	Granite	Saghinkan	core(CKB-259,405m)	○		
FR-37	Granite	Sautbay	core(CKB-73,85m)	○		

W.A: Whole rock analysis

T: Thin section

X: X-ray analysis

Ap. 1 List of Rock Samples(2)

Sample No.	Field Name	Locality	Remarks	Rock		
				W.A	T	X
FR-38	Granite	Sautbay	core(CKB-73,365m)	O	O	
FR-39	Granite	Sautbay	core(CKB-58,45m)	O		
FR-40	Granite	Sautbay	core(CKB-47,40m)	O		
MA-32	Porphyrite	North Bulutkan	outcrop(dyke)	O		
MA-33	Granodiorite	North Bulutkan	outcrop(dyke)	O		
MA-35	Granodiorite	North Bulutkan	outcrop	O	O	
MA-38	Granite porphyry	Sautbay	core(CKB-2818,52m)	O		
MA-44	Granite	Kokpatas	outcrop	O		
MA-1	Phillite	S.E.Kokpatas	weathered, partially Fe-stained			O
MA-2	Hornfels	Bulutkan	phillitic,Fe-stained			O
MA-4	Hornfels	Sautbay	quartz stock work, Fe-stained			O
MA-11	Limestone	Okjetpes	Fe-stained			O
MA-12	Siltstone	Barhanny	yellow loess			O
MA-13	Shale	S.Okjetpes	Fe-stained			O
MA-14	Shale	S.Okjetpes	Fe-stained			O
MA-17	Granite	Djylandy	weakly weathered			O
MA-20	Dolomite	Cholcharatau	weak skarinization			O
MA-21	Shale	Cholcharatau	weak skarinization			O
MA-28	Hornfels	Sarytau	blacky,biotite			O
MA-36	Granite	N.Bulutkan	weathered			O
MA-37	Shale>skarn,granite	Sautbay	float			O
MA-39	Siltstone	Kokpatas	Cretaceous sediment			O
MA-40	Granite	Kokpatas	altered plagiogranite			O
MA-41	Shale	Kokpatas	altered			O

W.A: Whole rock analysis

T: Thin section

X: X-ray analysis

Ap. 2 List of Ore Samples(1)

Sample No.	Locality	Remarks	Ore		
			A8	A5	P
FO-1	South Turbay	shaft waste, quartz with pyrite			O
FO-4	Okjetpes	shaft waste, oxidized ore (pyrite, arsenopyrite, gypsum, hydro-oxide copper)			O
FO-5	Okjetpes	shaft waste, grey quartz with sulphide veinlets			O
FO-7	Barhanny	shaft waste, quartz veins with hematite			O
FO-8	Sarytau 42° 09.58' N 64° 18.26' E	shaft waste, skarn			O
FO-13	Okjetpes	core(CKB-67,93m)			O
FO-15	Saghinkan	core(CKB-201,476.7 - 476.9m)			O
FO-16	Saghinkan	core(CKB-258,118m)			O
FO-22	Saghinkan	core(CKB-259,309.6m) granite			O
MA-27	Sarytau	granite with quartz, Mo			O
FO-3	North Turbay	outcrop, quartz veins in the silicified rock (EW,85N, W=2.15m)	O		
FO-6	Okjetpes	trench outcrop, quartz veins (N48W 75SW, W=3.9m)	O		
217125	Saghinkan	CKB217(345.5 - 349.3m) Hornfels	O		
217126	Saghinkan	CKB217(349.3 - 349.6m) Hornfels	O		
217127	Saghinkan	CKB217(349.6 - 352.2m) Hornfels	O		
217128	Saghinkan	CKB217(352.2 - 355.0m) Hornfels	O		
217130	Saghinkan	CKB217(355.8 - 356.7m) Hornfels	O		
217131	Saghinkan	CKB217(356.7 - 358.3m) Hornfels	O		
217133	Saghinkan	CKB217(358.7 - 359.3m) Hornfels	O		
217138	Saghinkan	CKB217(361.5 - 362.0m) Hornfels	O		
217139	Saghinkan	CKB217(362.0 - 362.8m) Hornfels	O		
217144	Saghinkan	CKB217(369.1 - 369.7m) Hornfels	O		
3361-1	Bulutkan	C-3361(0 - 2m) Siltstone		O	
3361-2	Bulutkan	C-3361(2 - 4m) Siltstone	O		
3361-3	Bulutkan	C-3361(4 - 6m) Siltstone		O	
3361-4	Bulutkan	C-3361(6 - 8m) Siltstone		O	
3361-5	Bulutkan	C-3361(8 - 10m) Siltstone	O		
3361-6	Bulutkan	C-3361(10 - 12m) Hornfels		O	
3361-7	Bulutkan	C-3361(12 - 14m) Hornfels		O	
3361-8	Bulutkan	C-3361(14 - 16m) Hornfels	O		
3361-9	Bulutkan	C-3361(16 - 18m) Hornfels		O	
3361-10	Bulutkan	C-3361(18 - 20m) Hornfels		O	
3361-11	Bulutkan	C-3361(20 - 22m) Hornfels		O	

A8: Chemical analysis(8 elements)

A5: Chemical analysis(5 elements)

P: Polish

Ap. 2 List of Ore Samples(2)

Sample No.	Locality	Remarks	Ore		
			A8	A5	P
324040	Turbay	3240(78.0 - 80.0m) Quartzite	○		
324041	Turbay	3240(80.0 - 82.0m) Quartzite		○	
324042	Turbay	3240(82.0 - 84.0m) Quartzite		○	
324043	Turbay	3240(84.0 - 86.0m) Quartzite		○	
324044	Turbay	3240(86.0 - 88.0m) Quartz		○	
324045	Turbay	3240(88.0 - 90.0m) Quartz	○		
324046	Turbay	3240(90.0 - 92.0m) Quartz		○	
324047	Turbay	3240(92.0 - 94.0m) Quartz		○	
324048	Turbay	3240(94.0 - 96.0m) Quartz		○	
121034	Sautbay	CKB-121(234.7 - 235.8m) Skarn	○		
121035	Sautbay	CKB-121(235.8 - 239.0m) Granitoid	○		
175036	Sautbay	CKB-175(85.0 - 86.5m) Limestone	○		
175037	Sautbay	CKB-175(86.5 - 87.5m) Quartzite	○		
175038	Sautbay	CKB-175(87.5 - 88.5m) Quartzite	○		
175039	Sautbay	CKB-175(88.5 - 90.2m) Quartzite	○		
175040	Sautbay	CKB-175(90.2 - 92.0m) Quartzite	○		
175041	Sautbay	CKB-175(92.0 - 93.3m) Skarn	○		
175042	Sautbay	CKB-175(93.3 - 94.6m) Skarn	○		
175043	Sautbay	CKB-175(94.6 - 95.6m) Skarn	○		
175044	Sautbay	CKB-175(95.6 - 97.0m) Skarn	○		
175045	Sautbay	CKB-175(97.0 - 98.4m) Skarn	○		
175047	Sautbay	CKB-175(98.8 - 100.3m) Skarn	○		

A8: Chemical analysis(8 elements)

A5: Chemical analysis(5 elements)

P: Polish

Ap. 3 Assay Results of Ore Samples

Sample No,	Locality	Remarks	Au g/t	Ag g/t	Cu %	Pb %	Zn %	WO3 %	Mo %	Bi %
Sensibility			0.1	0.1	0.01	0.01	0.01	0.01	0.01	0.01
FO-3	North Turbay	outcrop, quartz veins in the silicified rock (EW,85N, W=2.15m)	1.0	0.6	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
FO-6	Okjetpes	trench outcrop, quartz veins (N48W 75SW, W=3.9m)	1.4	3.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
217125	Saghinkan	CKB217(345.5 - 349.3m) Hornfels	0.2	3.2	0.01	<0.01	0.01	<0.01	<0.01	<0.01
217126	Saghinkan	CKB217(349.3 - 349.6m) Hornfels	<0.1	1.1	0.03	<0.01	0.01	<0.01	<0.01	<0.01
217127	Saghinkan	CKB217(349.6 - 352.2m) Hornfels	<0.1	9.8	0.03	<0.01	0.01	<0.01	<0.01	<0.01
217128	Saghinkan	CKB217(352.2 - 355.0m) Hornfels	0.1	<0.1	0.03	<0.01	<0.01	<0.01	<0.01	<0.01
217130	Saghinkan	CKB217(355.8 - 356.7m) Hornfels	<0.1	<0.1	0.01	<0.01	0.01	0.05	<0.01	<0.01
217131	Saghinkan	CKB217(356.7 - 358.3m) Hornfels	0.2	2.4	0.03	<0.01	0.02	0.38	<0.01	<0.01
217133	Saghinkan	CKB217(358.7 - 359.3m) Hornfels	<0.1	8.2	0.06	<0.01	0.01	<0.01	<0.01	<0.01
217138	Saghinkan	CKB217(361.5 - 362.0m) Hornfels	0.1	<0.1	0.04	<0.01	<0.01	1.40	<0.01	<0.01
217139	Saghinkan	CKB217(362.0 - 362.8m) Hornfels	0.1	4.0	<0.01	<0.01	<0.01	0.06	<0.01	<0.01
217144	Saghinkan	CKB217(369.1 - 369.7m) Hornfels	<0.1	20.8	0.02	0.02	<0.01	<0.01	<0.01	0.03
3361-1	Bulutkan	C-3361(0 - 2m) Siltstone	47.6	<0.1	0.10	<0.01	<0.01	-	-	-
3361-2	Bulutkan	C-3361(2 - 4m) Siltstone	88.3	6.4	0.12	<0.01	<0.01	<0.01	<0.01	0.07
3361-3	Bulutkan	C-3361(4 - 6m) Siltstone	14.9	10.8	0.07	<0.01	<0.01	-	-	-
3361-4	Bulutkan	C-3361(6 - 8m) Siltstone	91.5	35.3	<0.01	<0.01	<0.01	-	-	-
3361-5	Bulutkan	C-3361(8 - 10m) Siltstone	23.8	34.5	0.02	<0.01	<0.01	<0.01	<0.01	0.02
3361-6	Bulutkan	C-3361(10 - 12m) Hornfels	17.8	<0.1	0.31	<0.01	<0.01	-	-	-
3361-7	Bulutkan	C-3361(12 - 14m) Hornfels	11.4	9.5	0.28	<0.01	<0.01	-	-	-
3361-8	Bulutkan	C-3361(14 - 16m) Hornfels	3.5	17.4	0.47	<0.01	<0.01	<0.01	<0.01	<0.01
3361-9	Bulutkan	C-3361(16 - 18m) Hornfels	5.6	13.7	0.38	<0.01	<0.01	-	-	-
3361-10	Bulutkan	C-3361(18 - 20m) Hornfels	5.9	<0.1	0.35	<0.01	<0.01	-	-	-
3361-11	Bulutkan	C-3361(20 - 22m) Hornfels	10.5	1.4	0.47	<0.01	<0.01	-	-	-
324040	Turbay	3240(78.0 - 80.0m) Quartzite	1.1	16.6	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
324041	Turbay	3240(80.0 - 82.0m) Quartzite	2.9	<0.1	0.02	<0.01	<0.01	-	-	-
324042	Turbay	3240(82.0 - 84.0m) Quartzite	3.3	8.5	0.03	<0.01	<0.01	-	-	-
324043	Turbay	3240(84.0 - 86.0m) Quartzite	6.0	25.0	0.03	0.01	<0.01	-	-	-
324044	Turbay	3240(86.0 - 88.0m) Quartz	1.8	<0.1	0.02	<0.01	0.01	-	-	-
324045	Turbay	3240(88.0 - 90.0m) Quartz	4.1	21.4	0.02	<0.01	<0.01	<0.01	<0.01	0.01
324046	Turbay	3240(90.0 - 92.0m) Quartz	1.5	<0.1	0.01	<0.01	<0.01	-	-	-
324047	Turbay	3240(92.0 - 94.0m) Quartz	0.4	<0.1	0.02	<0.01	<0.01	-	-	-
324048	Turbay	3240(94.0 - 96.0m) Quartz	0.2	<0.1	0.01	<0.01	<0.01	-	-	-
121034	Sautbay	CKB-121(234.7 - 235.8m) Skarn	<0.1	2.9	0.06	<0.01	<0.01	<0.01	<0.01	<0.01
121035	Sautbay	CKB-121(235.8 - 239.0m) Granitoid	0.1	6.4	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
175036	Sautbay	CKB-175(85.0 - 86.5m) Limestone	0.6	1.6	0.16	<0.01	<0.01	2.63	<0.01	0.01
175037	Sautbay	CKB-175(86.5 - 87.5m) Quartzite	0.6	0.3	0.11	<0.01	<0.01	0.95	<0.01	0.01
175038	Sautbay	CKB-175(87.5 - 88.5m) Quartzite	0.5	32.2	0.18	<0.01	<0.01	2.05	<0.01	<0.01
175039	Sautbay	CKB-175(88.5 - 90.2m) Quartzite	<0.1	<0.1	0.08	<0.01	<0.01	0.39	<0.01	<0.01
175040	Sautbay	CKB-175(90.2 - 92.0m) Quartzite	<0.1	<0.1	0.02	<0.01	0.01	<0.01	0.04	<0.01
175041	Sautbay	CKB-175(92.0 - 93.3m) Skarn	0.5	0.3	0.46	<0.01	<0.01	2.25	<0.01	<0.01
175042	Sautbay	CKB-175(93.3 - 94.6m) Skarn	1.3	<0.1	0.36	<0.01	<0.01	5.62	<0.01	0.03
175043	Sautbay	CKB-175(94.6 - 95.6m) Skarn	0.7	<0.1	0.28	<0.01	<0.01	7.04	<0.01	0.02
175044	Sautbay	CKB-175(95.6 - 97.0m) Skarn	1.2	<0.1	0.13	<0.01	<0.01	5.97	<0.01	0.04
175045	Sautbay	CKB-175(97.0 - 98.4m) Skarn	0.1	1.9	0.37	<0.01	<0.01	0.86	<0.01	<0.01
175047	Sautbay	CKB-175(98.8 - 100.3m) Skarn	0.5	0.6	0.38	<0.01	<0.01	2.88	<0.01	<0.01

Ap. 4 Analysis Results of Whole Rock Samples

Sample No.	Field Name	Locality	Remarks	SiO_2 %	TiO_2 %	Al_2O_3 %	Fe_2O_3 %	FeO %	CaO %	MnO %	MgO %	Na_2O %	K_2O %	P_2O_5 %	LOI %
Sensibility				0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
FR-2	Lamprophyre	Bulutkan	float(Mid.Perm)	59.19	0.66	15.65	1.19	3.95	4.71	0.10	4.08	4.22	4.12	0.28	2.50
FR-3	Quartz syenite	Bulutkan	float(Late Carb.-Early Perm.)	65.09	0.48	14.87	<0.01	2.36	3.78	0.11	1.44	3.56	5.15	0.21	4.34
FR-4	Granodiorite	Burgut	core(No.673,45m)	68.24	0.44	16.01	0.42	2.66	3.50	0.04	1.23	4.49	2.48	0.15	9.26
FR-7	Granite	South Turbay	trench waste	67.92	0.52	15.78	1.28	1.34	2.14	0.04	1.55	4.34	4.22	0.13	1.76
FR-8	Granodiorite	South Turbay	trench waste	69.44	0.49	15.80	0.61	1.42	3.17	0.03	0.97	4.01	3.78	0.13	1.14
FR-9	Granodiorite	North Turbay	trench waste	66.28	0.73	15.95	1.14	2.23	3.28	0.04	1.26	4.43	3.15	0.18	1.00
FR-12	Granosyenite	Okjetpes	trench waste	57.00	1.00	14.25	1.02	4.56	5.07	0.10	6.54	4.01	2.04	0.29	3.92
FR-13	Granodiorite porphyry	Okjetpes 42° 03. 01' N 64° 05. 89' E	outcrop	70.21	0.39	15.97	1.15	1.59	0.78	0.03	1.22	6.28	1.23	0.15	1.72
FR-14	Microdiorite	Okjetpes	shaft waste	53.97	1.04	14.32	1.77	4.59	5.89	0.10	6.56	3.52	2.24	0.31	5.16
FR-16	Quartz diorite porphyry	Barhanny	trench waste(Pre. ore)	62.19	0.98	17.30	1.72	2.56	1.26	0.03	2.97	5.16	1.18	0.38	4.05
FR-17	Granodiorite	Barhanny 42° 02' 24"N 64° 09' 56"E	trench waste	67.57	0.53	15.19	0.51	2.41	2.15	0.03	2.48	6.03	0.48	0.19	3.22
FR-18	Two mica granite	Djylandy 42° 10. 45' N 63° 42. 82' E	outcrop(Oltyntau intrusive, Late Carb. - Perm.)	74.03	0.11	14.65	<0.01	0.87	0.77	0.03	0.20	3.61	5.42	0.19	5.16
FR-19	Aplite(pegmatitic)	Djylandy	core(No.2)	75.20	0.03	14.20	0.47	0.66	0.54	0.40	0.07	4.47	3.78	0.09	4.56
FR-20	Quartz diorite	Djylandy	core(No.2)	72.31	0.25	15.30	0.02	1.84	1.77	0.07	0.50	4.86	2.87	0.05	0.51
FR-22	Microgranite	Sarytau	shaft waste	70.46	0.45	15.54	0.46	2.23	2.65	0.04	0.68	4.46	2.77	0.13	8.05
FR-23	Granodiorite	Sarytau 42° 09' 16"N 64° 18' 14"E	shaft waste	70.24	0.40	15.39	0.37	2.11	2.36	0.03	0.58	4.30	3.18	0.10	7.62
FR-25	Microgranite	Sarytau	outcrop(dyke) EW75-80N, W=3m	68.58	0.60	15.98	1.28	2.02	2.71	0.05	0.92	4.50	3.09	0.14	8.48
FR-27	Lamprophyre	Okjetpes	core(CKB-57,150m)	49.97	1.48	14.21	1.23	6.18	5.93	0.12	7.85	3.52	1.65	0.36	6.34
FR-29	Lamprophyre	Okjetpes	core(CKB-60,39.0m)	52.32	1.26	15.07	1.31	6.00	5.35	0.12	7.11	3.75	3.42	0.40	3.13
FR-30	Diorite	Okjetpes	core(CKB-94,45.0m)	46.22	1.03	12.41	1.28	7.02	7.22	0.14	9.69	2.48	1.20	0.21	9.24
FR-31	Granite	Sautbay	core(CKB-26,145m)	66.31	0.53	16.45	0.88	2.55	4.60	0.06	1.36	4.80	1.12	0.21	1.15
FR-32	Granite porphyry	Sautbay	core(CKB-26,215m)	65.92	0.48	16.16	1.12	2.52	2.78	0.05	1.49	4.88	2.66	0.16	1.54
FR-33	Aplite	Sautbay	core(CKB-26,362m)	75.54	0.03	13.24	0.37	0.45	0.63	0.02	0.05	5.02	3.67	<0.01	8.17
FR-34	Granite porphyry	Saghinkan	core(CKB-258,72m)	66.34	0.48	16.46	1.36	1.98	3.40	0.06	1.41	4.74	1.82	0.16	1.72
FR-35	Aplite	Saghinkan	core(CKB-258,84m)	77.26	0.04	12.50	0.41	0.23	1.48	0.02	0.12	5.16	2.21	0.05	1.40
FR-36	Granite	Saghinkan	core(CKB-259,405m)	72.66	0.24	14.54	0.59	1.08	1.70	0.02	0.59	4.33	4.04	0.07	7.94
FR-37	Granite	Sautbay	core(CKB-73,85m)	67.83	0.46	16.46	1.09	2.11	3.16	0.04	1.14	4.58	2.80	0.16	7.40
FR-38	Granite	Sautbay	core(CKB-73,365m)	72.42	0.26	14.72	0.51	1.45	1.88	0.03	0.69	4.21	3.55	0.09	6.94
FR-39	Granite	Sautbay	core(CKB-58,45m)	62.50	0.72	16.16	1.52	2.42	2.30	0.06	2.55	3.87	5.44	0.32	1.83
FR-40	Granite	Sautbay	core(CKB-47,40m)	62.04	0.77	15.68	1.49	2.78	2.40	0.08	3.02	3.78	5.51	0.33	2.01
MA-32	Porphyrite	North Bulutkan	outcrop(dyke)	70.93	0.38	15.56	0.74	1.82	2.52	0.05	0.77	4.63	2.38	0.11	0.57
MA-33	Granodiorite	North Bulutkan	outcrop(dyke)	70.88	0.37	15.29	0.51	1.74	2.37	0.05	0.69	4.84	2.85	0.13	6.74
MA-35	Granodiorite	North Bulutkan	outcrop	68.73	0.64	16.82	1.10	2.19	0.61	0.03	1.49	4.34	2.89	0.19	2.14
MA-38	Granite porphyry	Sautbay	core(CKB-2818,52m)	69.92	0.39	15.48	0.47	1.92	2.82	0.03	1.03	5.31	2.21	0.13	1.21
MA-44	Granite	Kokpatas	outcrop	61.83	0.75	15.95	0.99	3.77	4.69	0.08	3.69	4.46	2.99	0.25	5.63

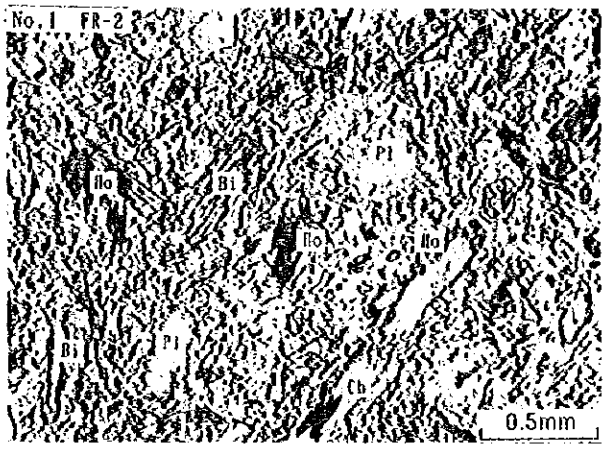
Ap. 5 Photomicrographs and Microscopic Observations of Thin Sections

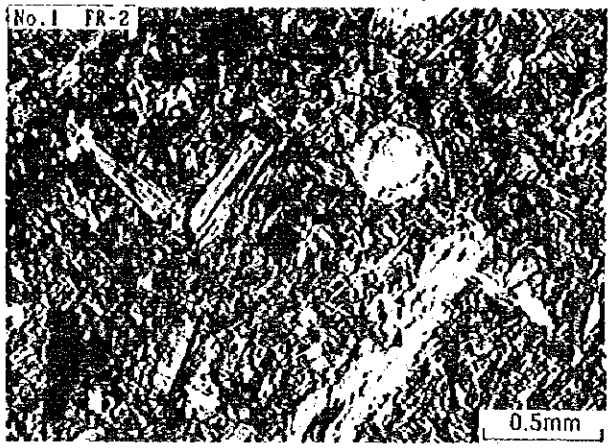
No.	Sample number	Rock name	Locality	Primary mineral												Sec. miner.						Remarks
				Qz	Kf	Pl	Bi	Ms	Ho	Op	Sp	Ap	Fl	Al	Zr	Mz	Ch	Se	C	Ep	Ac	Lc	
1	FR-2	Lamprophyre	Bultkan, float	※	※	○	○		○		※	※					△	※	△		△	※	
2	FR-3	Quartz syenite	Bultkan, float	△	◎	○	△		△			※		※			△	※	△			※	
3	FR-8	Granodiorite	South Turbaym, trench waste	○	△	◎	△		△	※	※				※		※	※					Kf:porphyritic
4	FR-13	Granodiorite porphyry	Okjetpes, outcrop	○	△	◎	△			※					※		△	△					Op:hematite
5	FR-16	Quartz diorite porphyry	Barkjannyl, trench waste	△	△	○	○		○	※		※					△	△	※				Op:hematite
6	FR-23	Granodiorite	Sarytau, shaft waste	○	○	◎	○				※	※	※		※		※	※		※			
7	FR-27	Lamprophyre	Okjetpes, core(CKB-57, 150m)	※	※	○	○		○	※		△					※	△	△		※	※	Bi:phlogopitic
8	FR-29	Lamprophyre	Okjetpes, core(CKB-60, 58m)	※		○	○		○			※					※	※	△		△	※	Bi:phlogopitic
9	FR-35	Aplite	Saghiskan, core(CKB-258, 84m)	◎	○	○	※	※		※							※	※	※	※			Micrographic
10	FR-38	Granite	Sautbay, core(CKB-73, 365m)	◎	○	◎	△				※				※		※	※	※				with Py-Qz vein
11	MA-35	Granodiorite	North Bultkan, outcrop	○	△	◎	○								※	※	※	※					

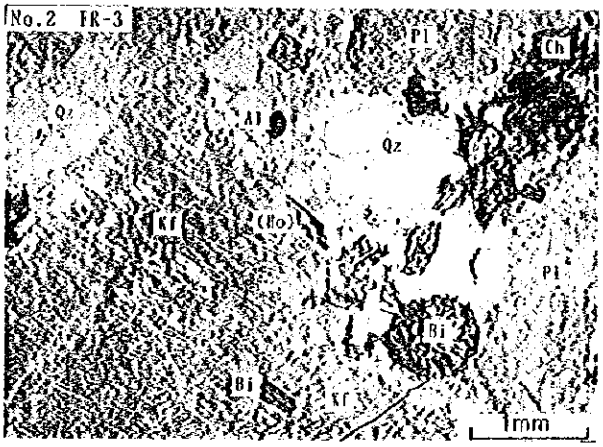
Qz:Quartz Kf:K-feldspar Pl:Plagioclase Bi:Biotite Ms:Muscovite Ho:Hornblende Op:Opaque mineral Sp:Sphene
Ap:Apatite Fl:Fluorite Al:Allanite Zr:Zircon Mz:Monazite Se:Sericite C:Calcite Ep:Epidote Ac:Actinolite-tremolite
Lc:Leucoxene
◎:Abundant ○:Common △:Poor ※:Rare

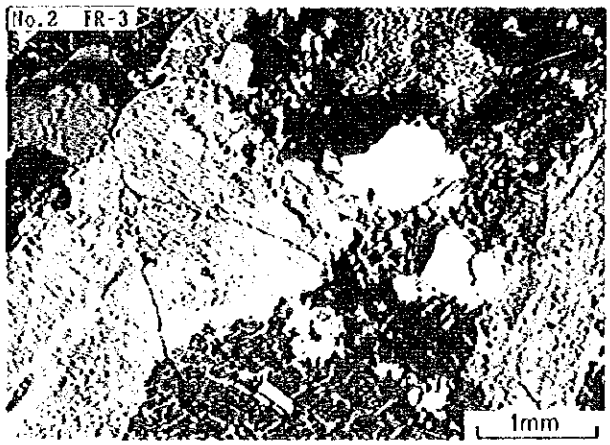
Plane polarized light

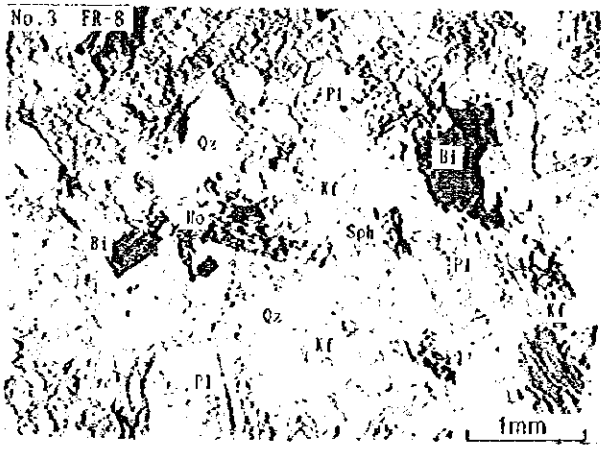
Crossed polarized light

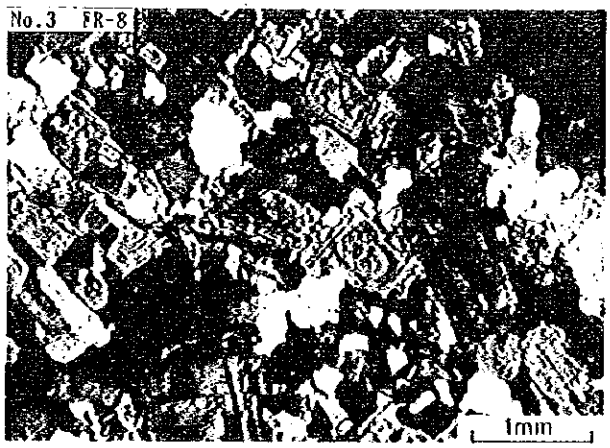


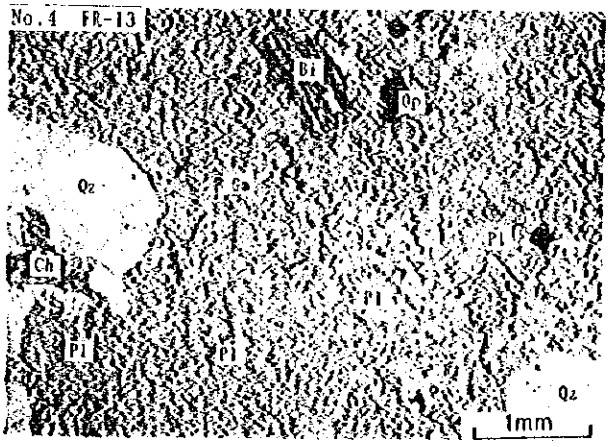


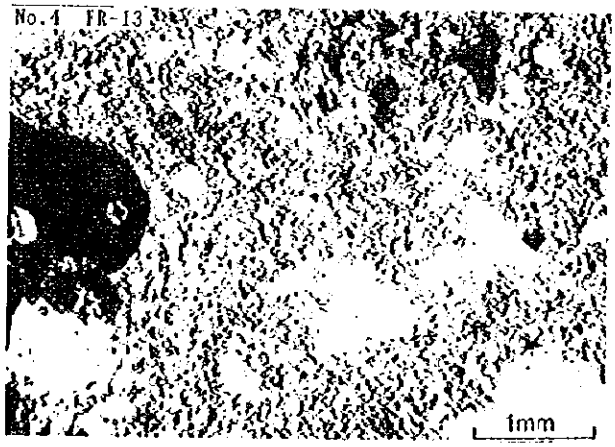






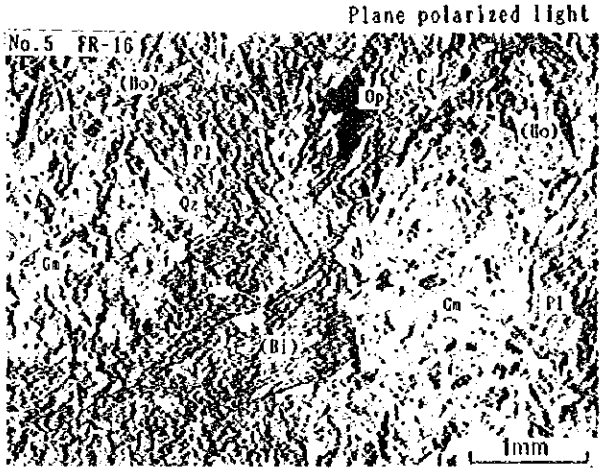


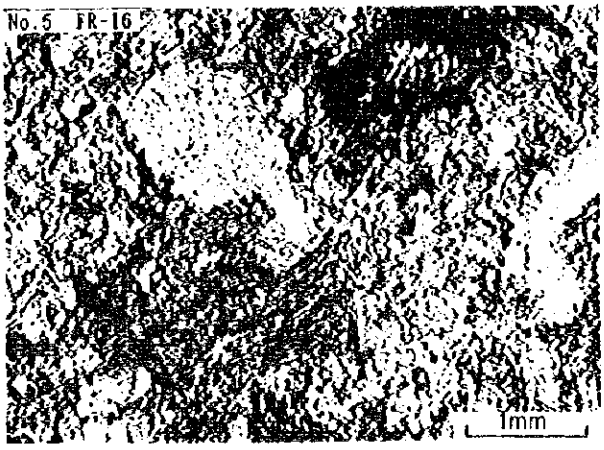


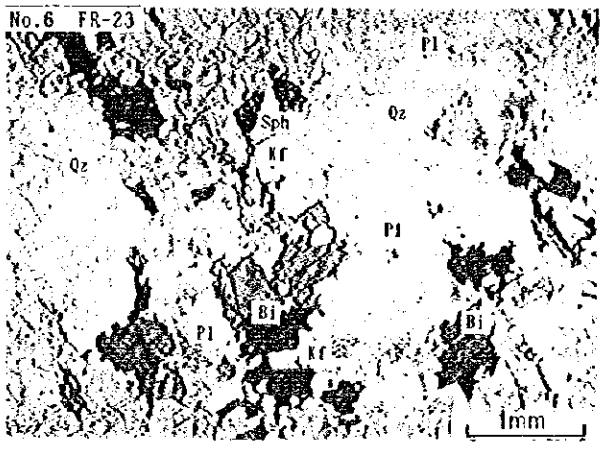


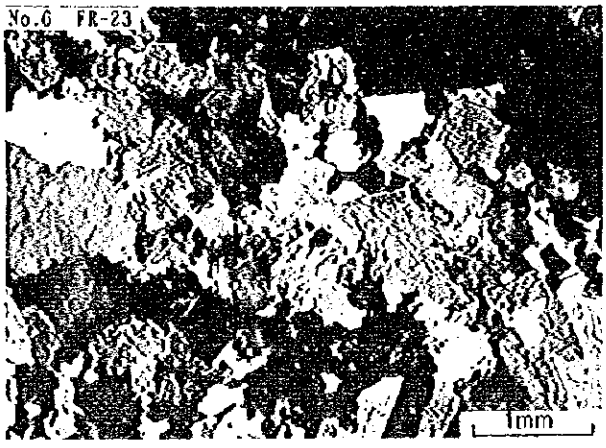
Plane polarized light

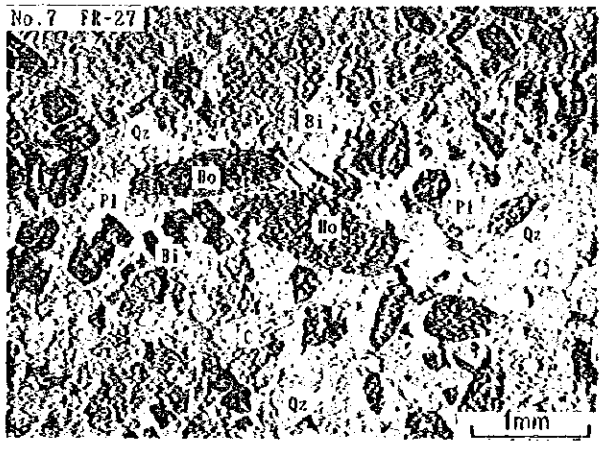
Crossed polarized light

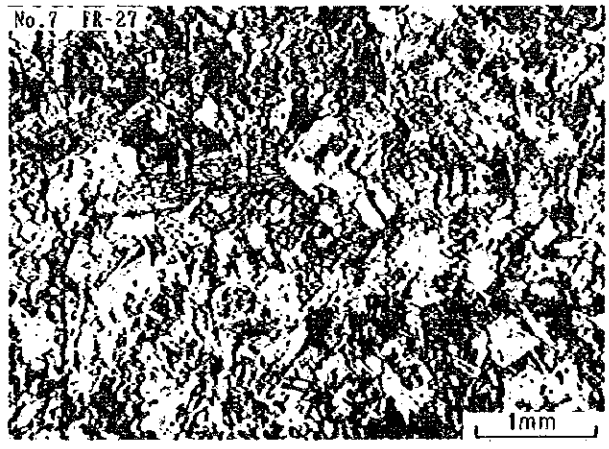


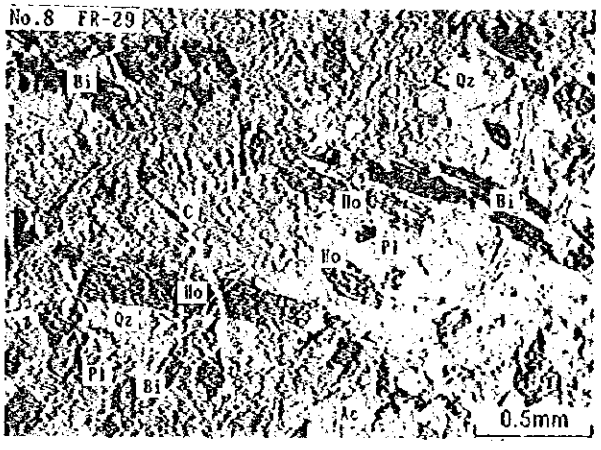


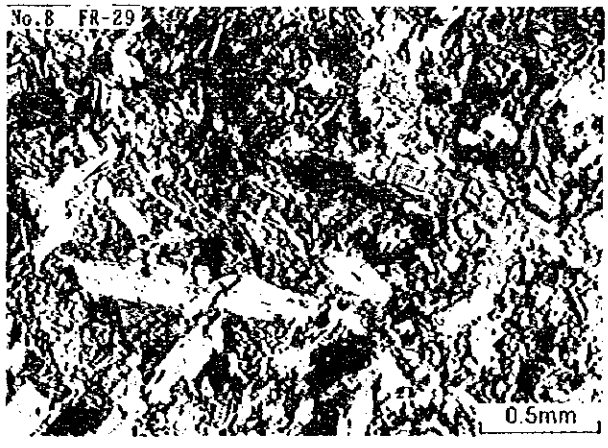






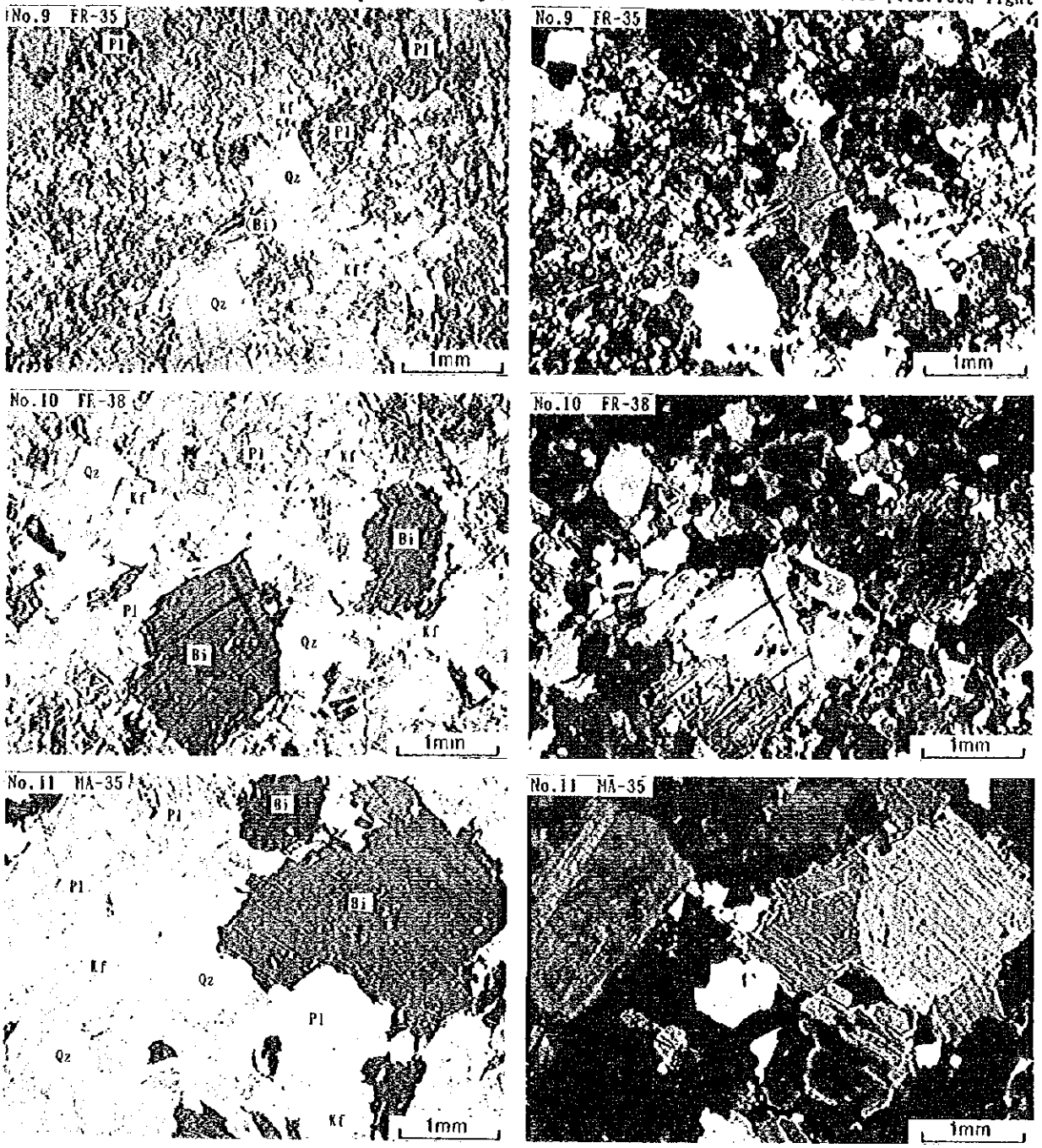






Plane polarized light

Crossed polarized light



ABBREVIATION

Al : Allanite
Bi : Biotite
(Bi): Pseudomorph after biotite
C : Calcite
Ch : Chlorite
Gm : Groundmass
Ho : Hornblende
(Ho): Pseudomorph after hornblende
Kf : K-feldspar
Op : Opaque mineral
Pl : Plagioclase
Qz : Quartz
Sph: Sphene

Ap. 6 Photomicrographs and Microscopic Observations of Polished Sections (1)

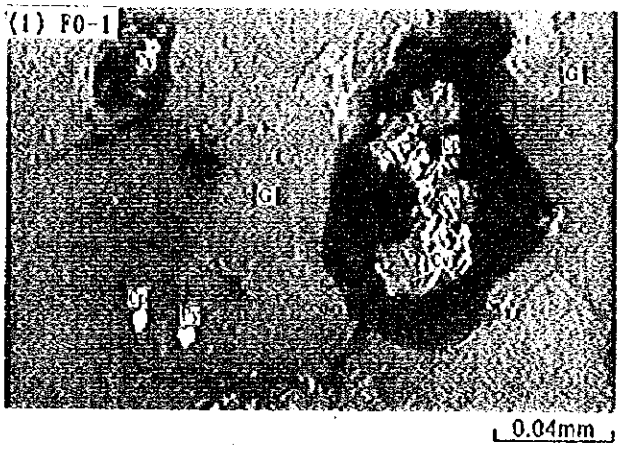
Sample Number		F0-1	F0-4		F0-5		F0-7		F0-8	
Locality		South Turbay	Okjetpes		Okjetpes		Barkhannyl		Sarytau 42° 09′ 58″ N 64° 18′ 26″ E	
Ore mineral	Abbr	Remarks	Am	Remarks	Am	Remarks	Am	Remarks	Am	Remarks
Native bismuth	Bi									
Bismuthinite	Bm									
Molybdenite	Mo									
Pentlandite	Pn									
Chalcopyrite	Cp	10 μm, dissem								
Covelline	Cv	Cp-repl, 2nd			※	coex-Gt				
Galena	Gn									
Sphalerite	Sp									
Arsenopyrite	Asp									
Pyrrhotite	Po									
Pyrite	Py	eu～an, por, vein	△	an, dissem	◎	eu～an, diss～vein	※	an, dissem		
Marcasite	Ms									
Hematite	Hm		○	coexisting,			△	eu～an, few～20 μm		
Goethite	Gt		○	coroform str	△?	Py-repl, 2nd			※	5～20 μm, 2nd
Ilmenite	Il									
Sphene	Sph									

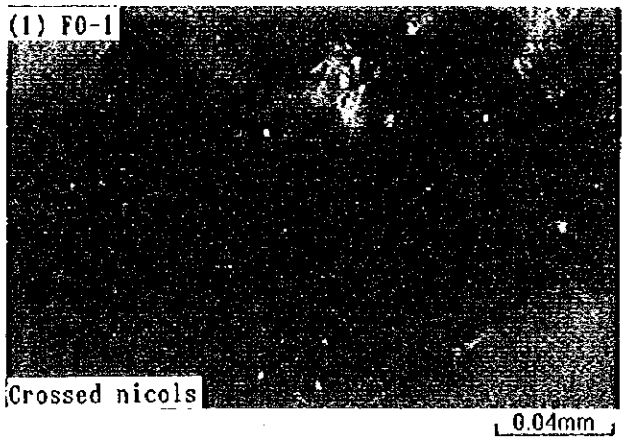
Abbr:Abbreviations Am:Amount an:anhedral coex-:coexisting with dissem:disseminated eu:euhedral por:porphyritic repl-:replacing 2nd:secondary str:structure
◎ abundant ○ common △ poor ※ rare

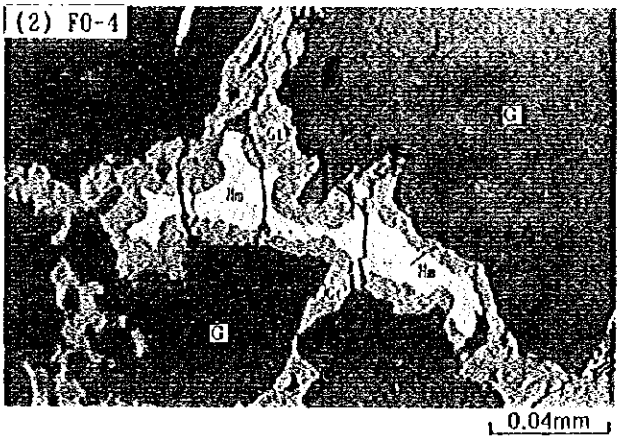
Ap. 6 Photomicrographs and Microscopic Observations of Polished Sections (2)

Sample Number		FO-13		FO-15		FO-16		FO-22		MA-27	
Locality		Okjetpes CKB 67.93m		Saghinkan CKB 201, 476.7-476.9m		Saghinkan CKB 258, 118m		CKB 259, 309.6m		Sarytau	
Ore mineral	Abbr	Am	Remarks	Am	Remarks	Am	Remarks	Am	Remarks	Am	Remark
Native bismuth	Bi					△	few~50μm, in Bm				
Bismuthinite	Bm					△	few~200μm, dissem~vein				
Molybdenite	Mo	※?	80μm, one grain	※	in Po, 30μm			※	500μm, one grain	△	120μm, one grain
Pentlandite	Pn			※	few~150μm, coex-Po						
Chalcopyrite	Cp			※	few~50μm, coex-Po	△	10~250μm, dissem	※	few~50μm, dissem		
Covelline	Cv									※	few~50μm, dissem
Galena	Gn					※	few~150μm, in Py				
Sphalerite	Sp					※	few μm, coex-Cp	※	150μm, coex Cp		
Arsenopyrite	Asp					※	few~30μm, eu				
Pyrrhotite	Po			※	0.3~few μm, dissem	※	few~30μm, in Py & Ms	※	few~120μm, in Py	△	few~200μm, dissem
Pyrite	Py	◎	eu, aggr~dissem			○	eu~an, aggr~vein	△	eu~an, vein~dissem	△	eu~an, dissem
Marcasite	Ms					○	coex Py	△	coex Py		
Hematite	Hm										
Goethite	Gt	※	repl-Py, 2nd								
Ilmenite	Il							※	30~120μm, dissem	※	20~300μm, coex-Sph
Sphene	Sph									△?	sporadic

Abbr:Abbreviations aggr:aggregated Am:Amount an:anhedral coex-:coexisting with dissem:disseminated eu:euhedral repl-:replacing 2nd:secondary
◎ abundant ○ common △ poor ※ rare


(1) FO-1
G
Gl
Qz
0.04mm


(1) FO-1
Crossed nicols
0.04mm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Gl
Hm
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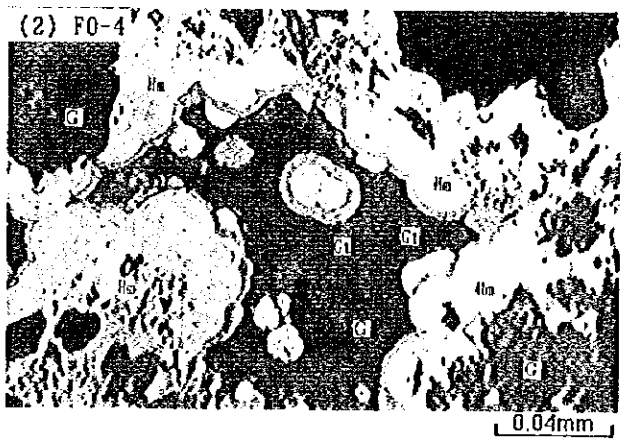
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Hm
G
Gl
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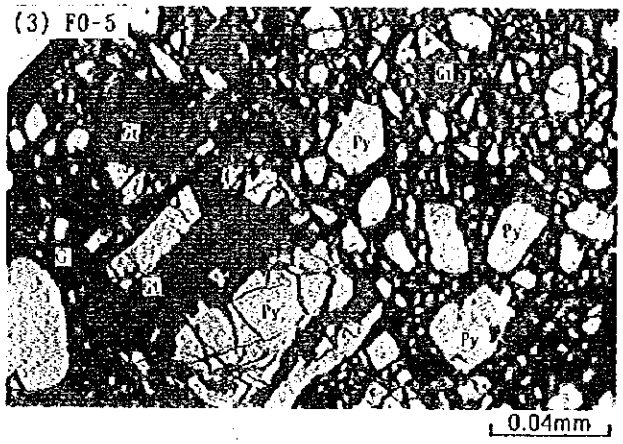
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Gl
Py
G
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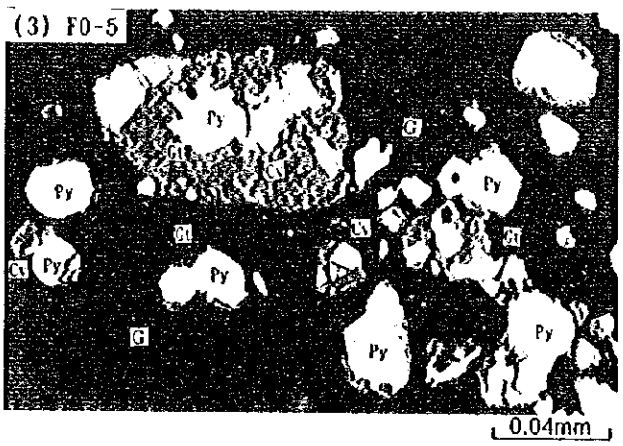
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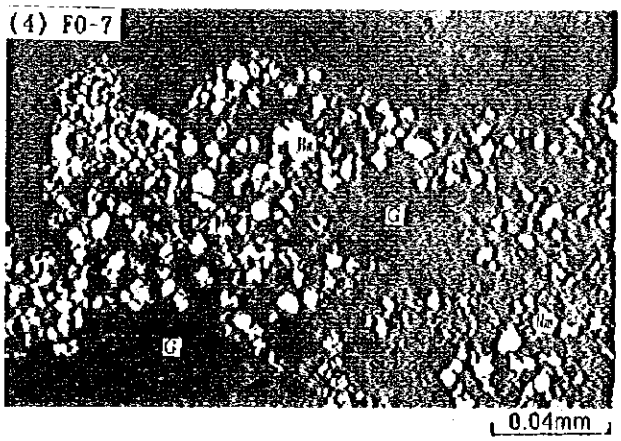
Py
G
Gl
0.04mm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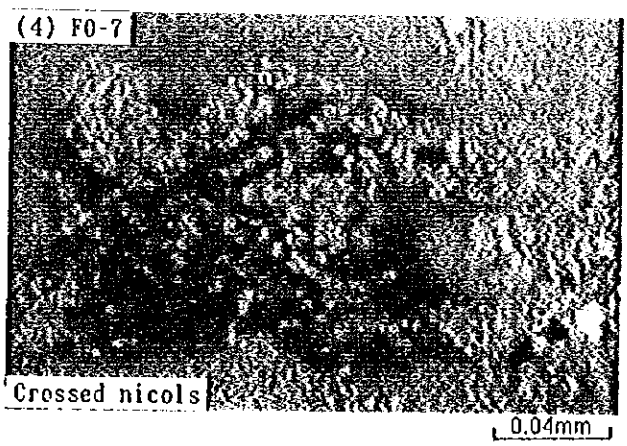
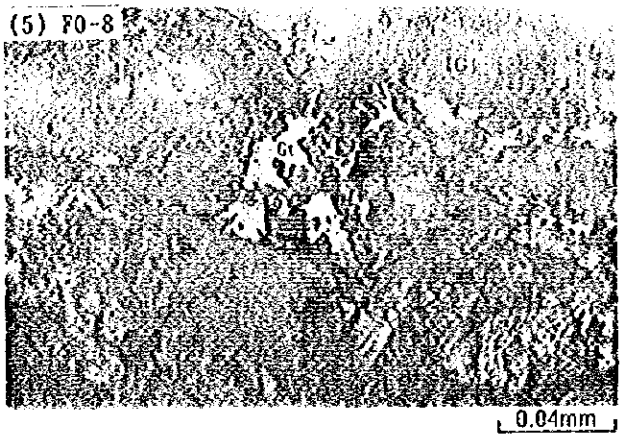
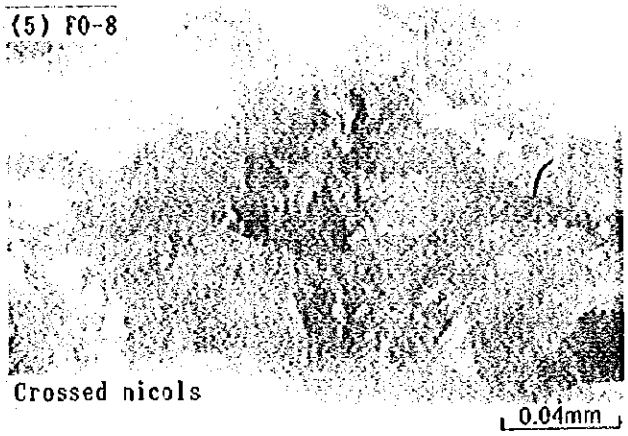
Hm
G
0.04mm


(4) FO-7
Crossed nicols
0.04mm


(5) FO-8
Gt
G
0.04mm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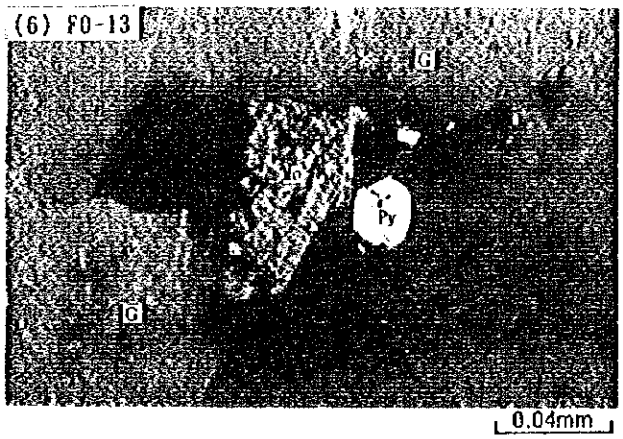
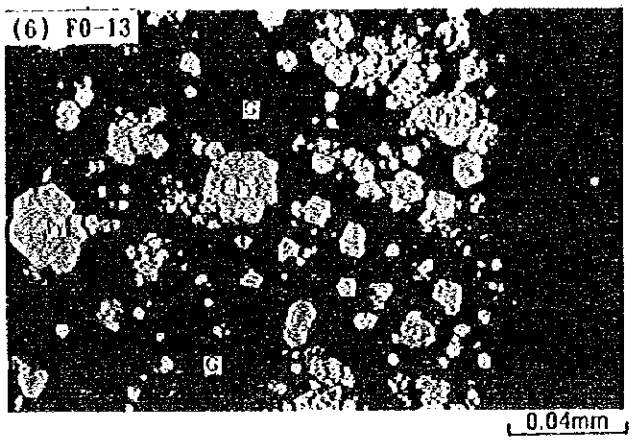

(6) FO-13
G
Py
G
0.04mm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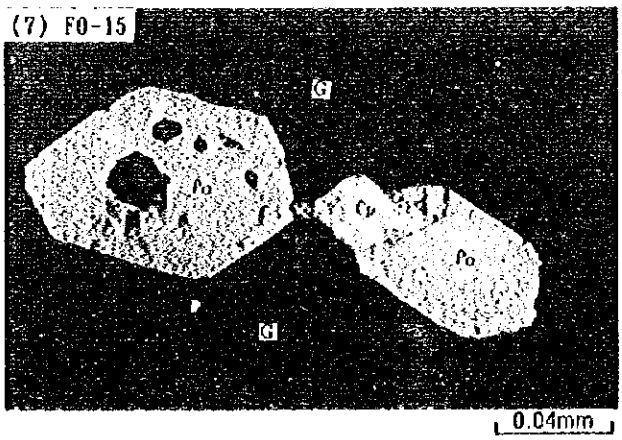
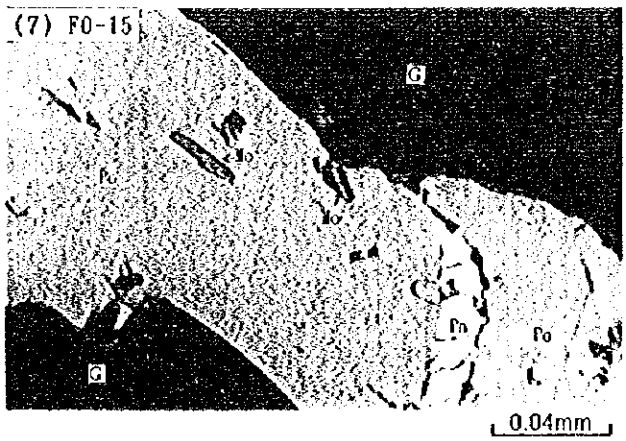
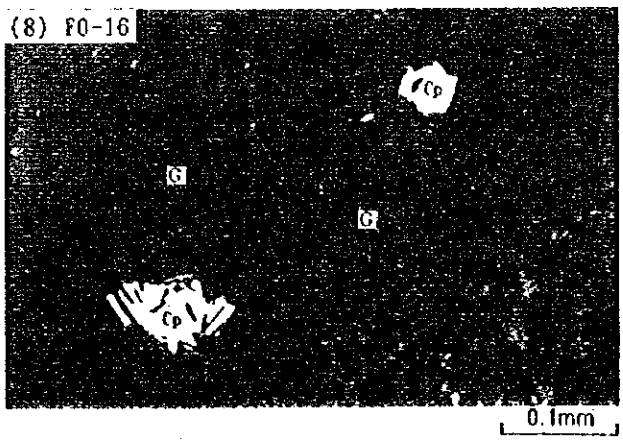
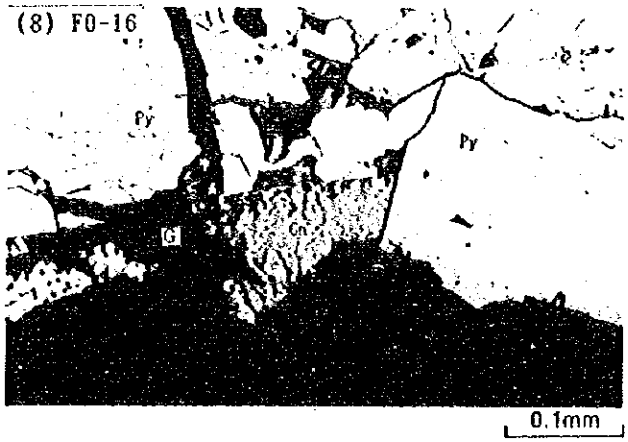
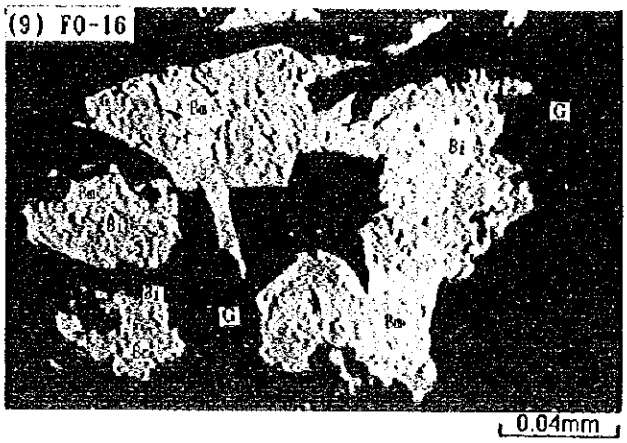
G
G
0.04mm

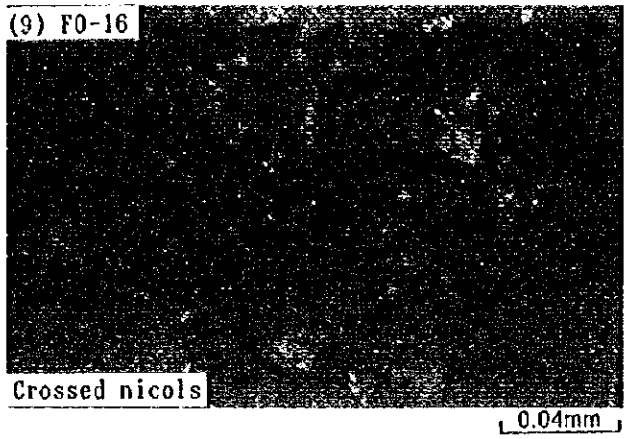

(7) FO-15
G
Po
Cp
Po
G
0.04mm


(7) FO-15
G
Po
Po
Po
G
0.04mm


(8) FO-16
Cp
G
G
Cp
0.1mm


(8) FO-16
Py
Py
G
0.1mm


(9) FO-16
G
Bi
Bi
G
Bi
0.04mm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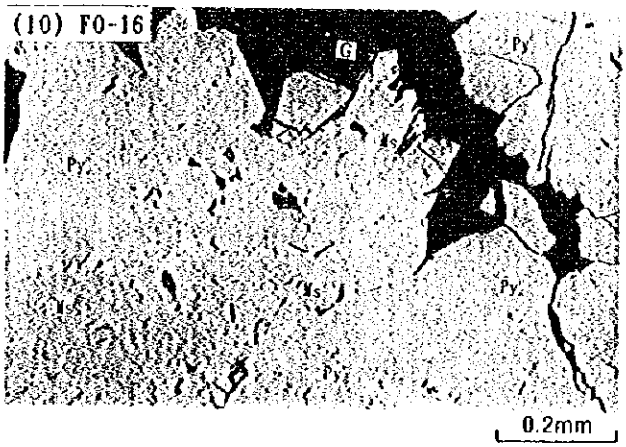
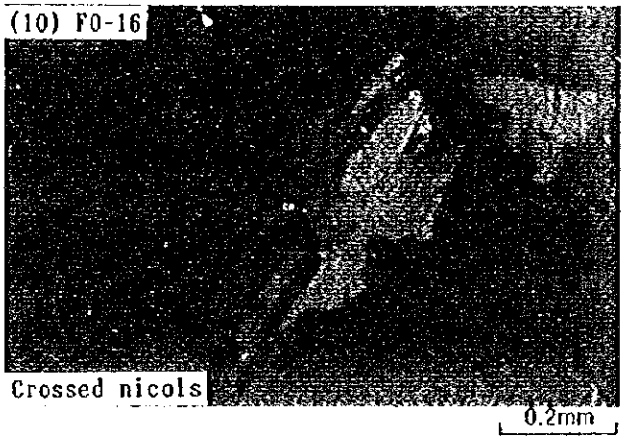

(10) FO-16
G
Py
Py
Py
Py
0.2mm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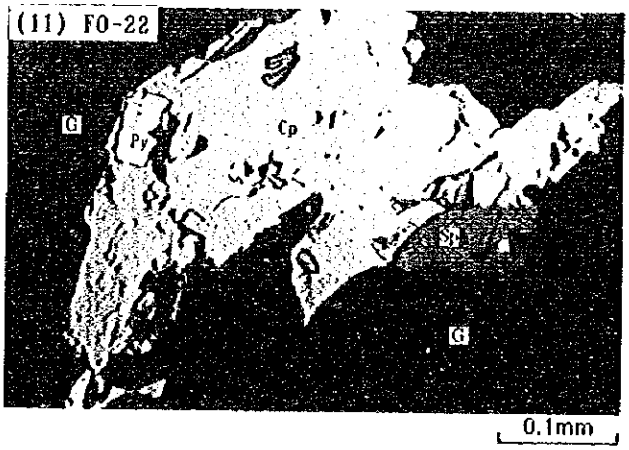
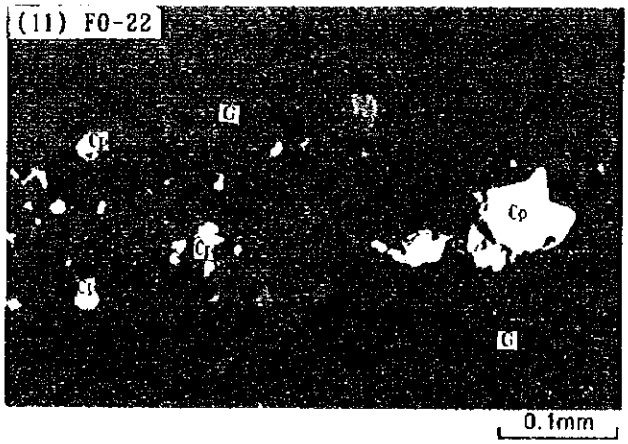
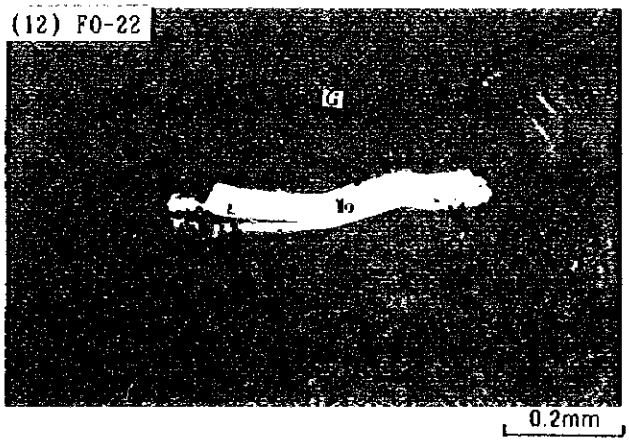
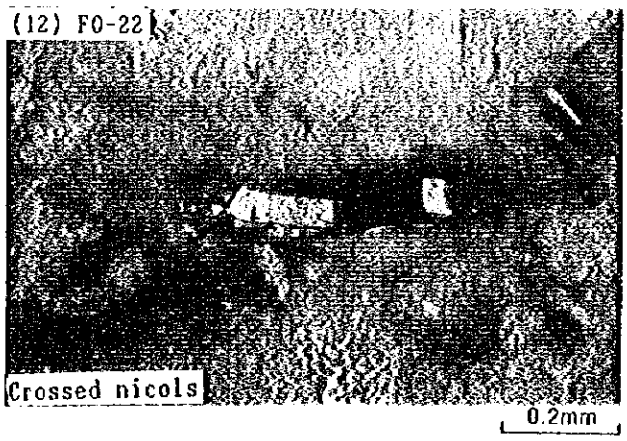
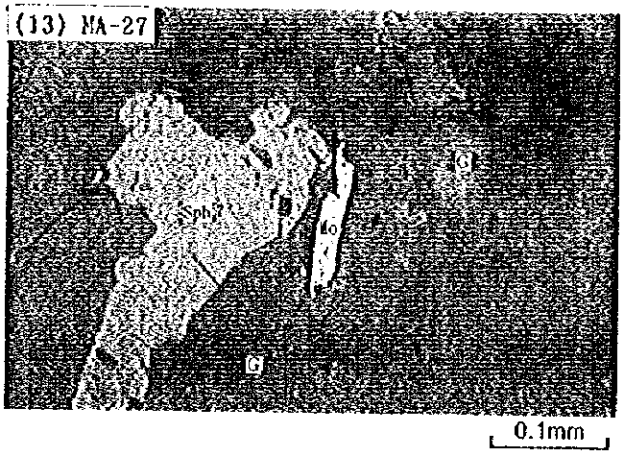
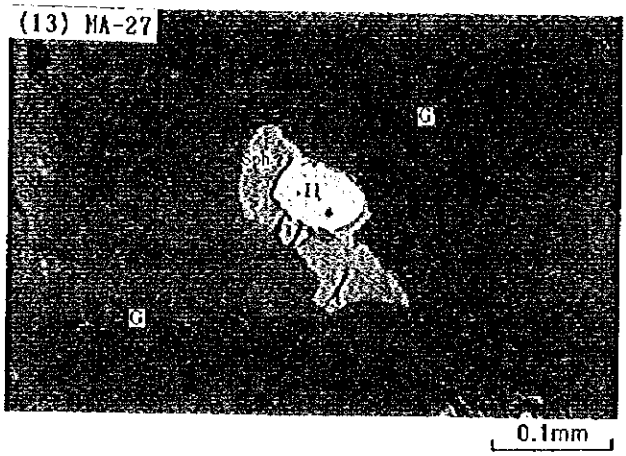

(11) FO-22
G
Py
Cp
G
0.1mm


(11) FO-22
G
Cp
G
0.1mm


(12) FO-22
G
Mo
0.2mm


(12) FO-22
Crossed nicols
0.2mm





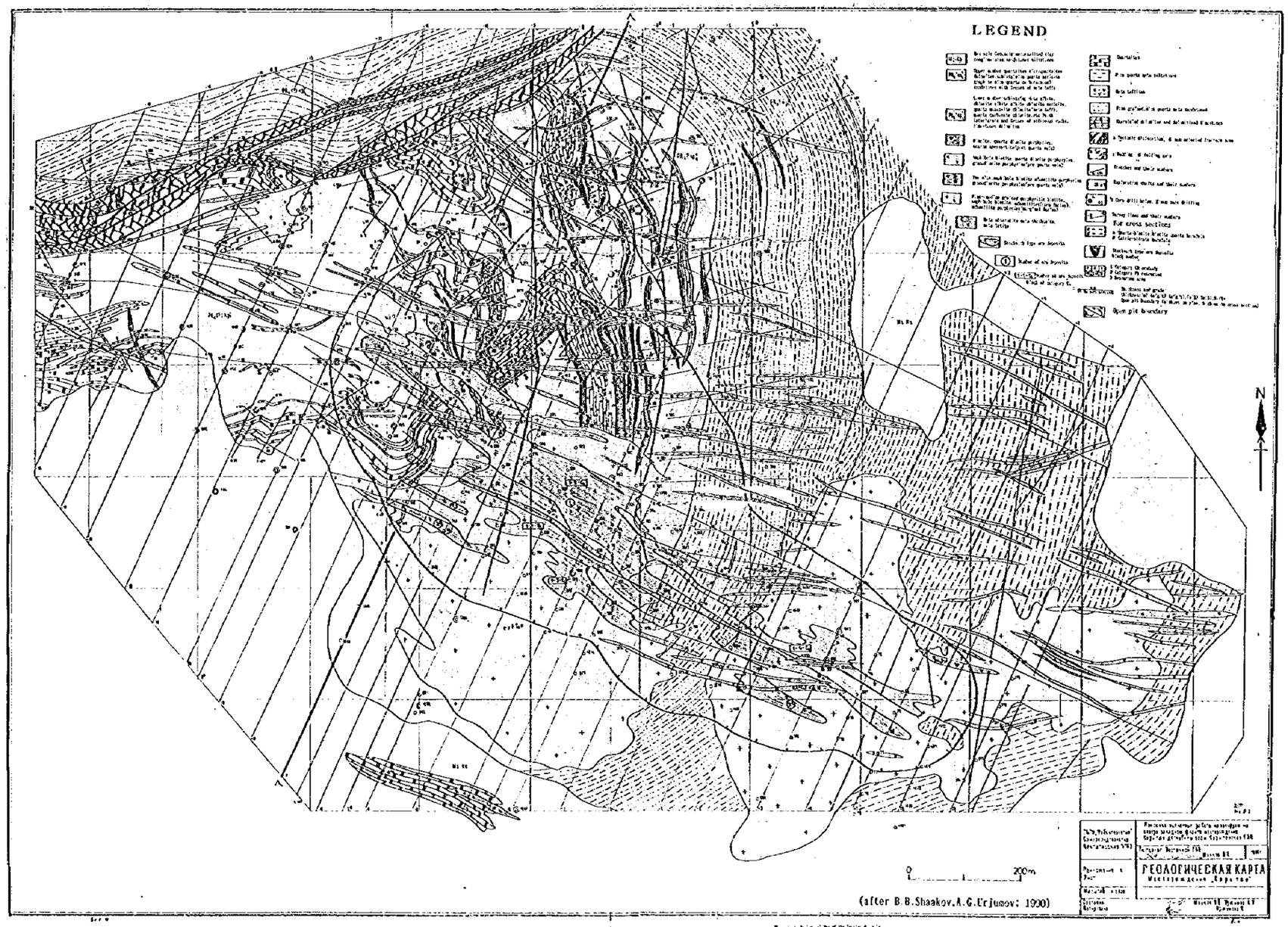
Abbreviations

Asp	: Arsenopyrite	Il	: Ilmenite
Bi	: Native bismuth	Mo	: Molybdenite
Bm	: Bismuthinite	Ms	: Marcasite
Cp	: Chalcopyrite	Pn	: Pentlandite
Cv	: Covellite	Po	: Pyrrhotite
G	: Gangue minerals	Py	: Pyrite
Gn	: Galena	Sp	: Sphalerite
Gt	: Goethite	Sph	: Sphene
Hm	: Hematite		

Ap. 7 Summary of X-ray Diffraction Analysis

No.	Sample number	Locality	Silicate										Sulfate		Carbonate		Sulfi	Hydr	Hal-	Remarks
			Qz	Sm	Ka	Se	Ch	Ph	Pl	Kf	Bi	Ho	Al	Gy	C	Do	Py	Gt	te	
1	MA-1	Southeast Kokpatas	◎			○				※			○	※						
2	MA-2	Bulutkan									△			◎				△		
3	MA-4	Sautbay	◎			※			◎					※				※		
4	MA-11	Okjetpes			△	△			△	※?				△				△		
5	MA-12	Barhanny	◎			※	△		○	△		※			○	△	※			
6	MA-13	South Okjetpes	◎			※									△	◎		※		
7	MA-14	South Okjetpes	◎			△	△		○									※		
8	MA-17	Djylandy	◎						◎	○	△				※					
9	MA-20	Cholcharatau										◎			◎					Tremolite
10	MA-21	Cholcharatau		△		※	△		○			○								Tremolite
11	MA-28	Sarytau	◎					○?	○	※										
12	MA-36	North Bulutkan	◎				※		◎	△	○				※					
13	MA-37	Sautbay	◎					○?	◎						△					
14	MA-39	Kokpatas	◎		△	△	△												△	
15	MA-40	Kokpatas	◎			※			◎					△						
16	MA-41	Kokpatas	◎			△														

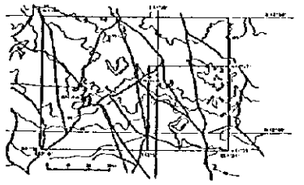
Al:Alunite Bi:Biotite C:Calcite Ch:Chlorite Do:Dolomite Gt:Goethite Gy:Gypsum Ho:Hornblende
Hydr:Hydroxide Ka:Kaolinite Kf:K-feldspar Ph:Phlogopite Pl:Plagioclase Py:Pyrite Qz:Quartz
Se:Sericite Sulfi:Sulfide Sm:Smectite
◎ Abundant ○ Common △ Poor ※ Rare



Pl. R-1-1

THE MINERAL EXPLORATION IN THE EASTERN BUKANTAU AREA THE REPUBLIC OF UZBEKISTAN (PHASE I)

GEOLOGICAL MAP OF THE SARYTAU DEPOSITS



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7

7

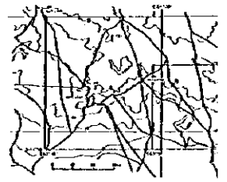
LEGEND

7 - 7

(after A.G.Urjunov ; 1900)

THE MINERAL EXPLORATION
IN
THE EASTERN BUKANTAU AR
THE REPUBLIC OF UZBEKIST
(PHASE I)

GEOLOGICAL CROSS SECTION (LINE
OF THE SARYTAU DEPOSITS



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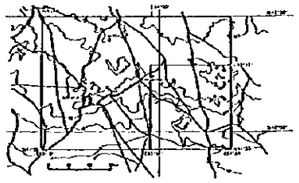
THE MINERAL EXPLORATION IN THE EASTERN BUKANTAU AREA THE REPUBLIC OF UZBEKISTAN (PHASE I)

GEOLOGICAL MAP OF THE SAUTBAY ORE DEPOSITS



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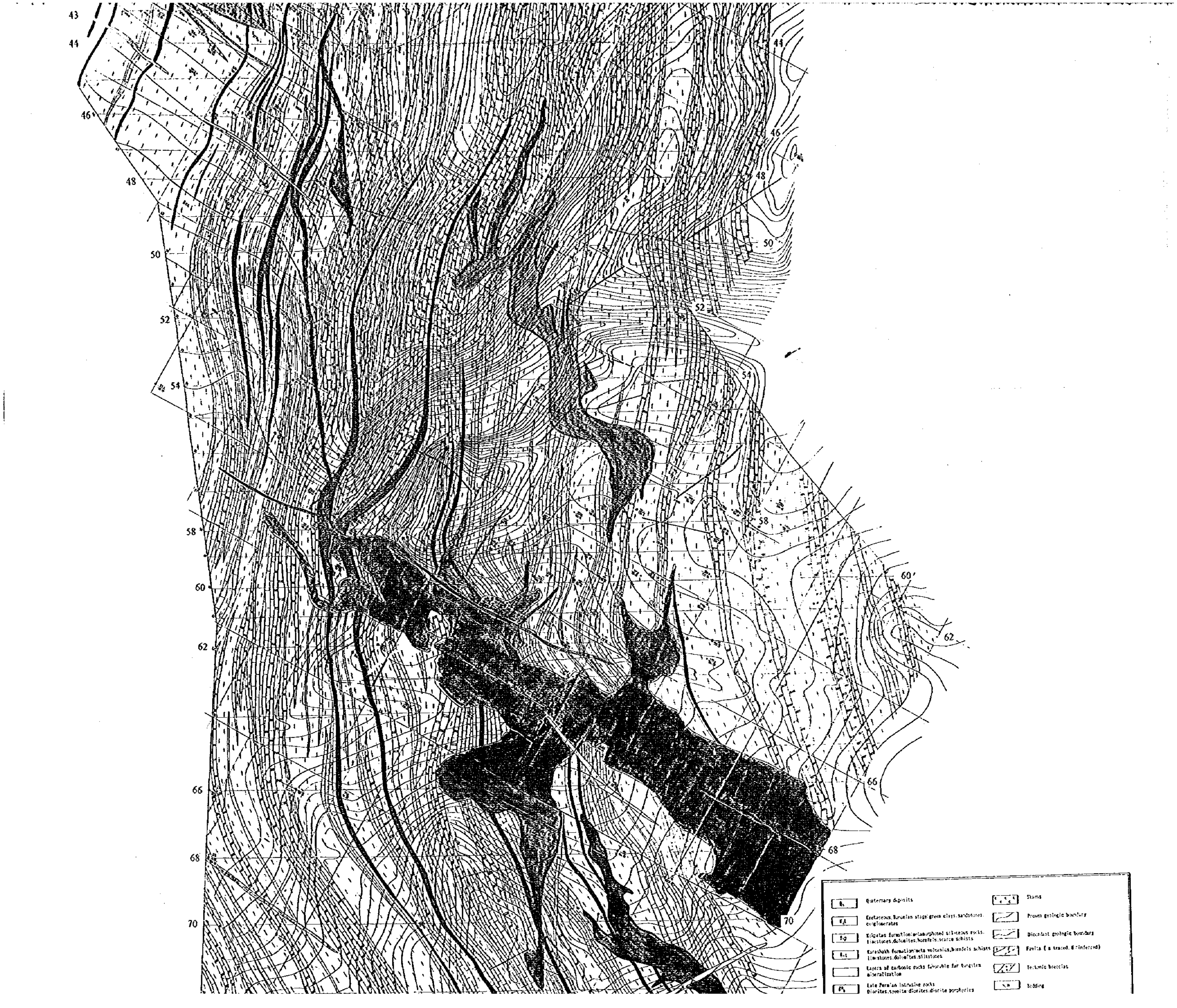
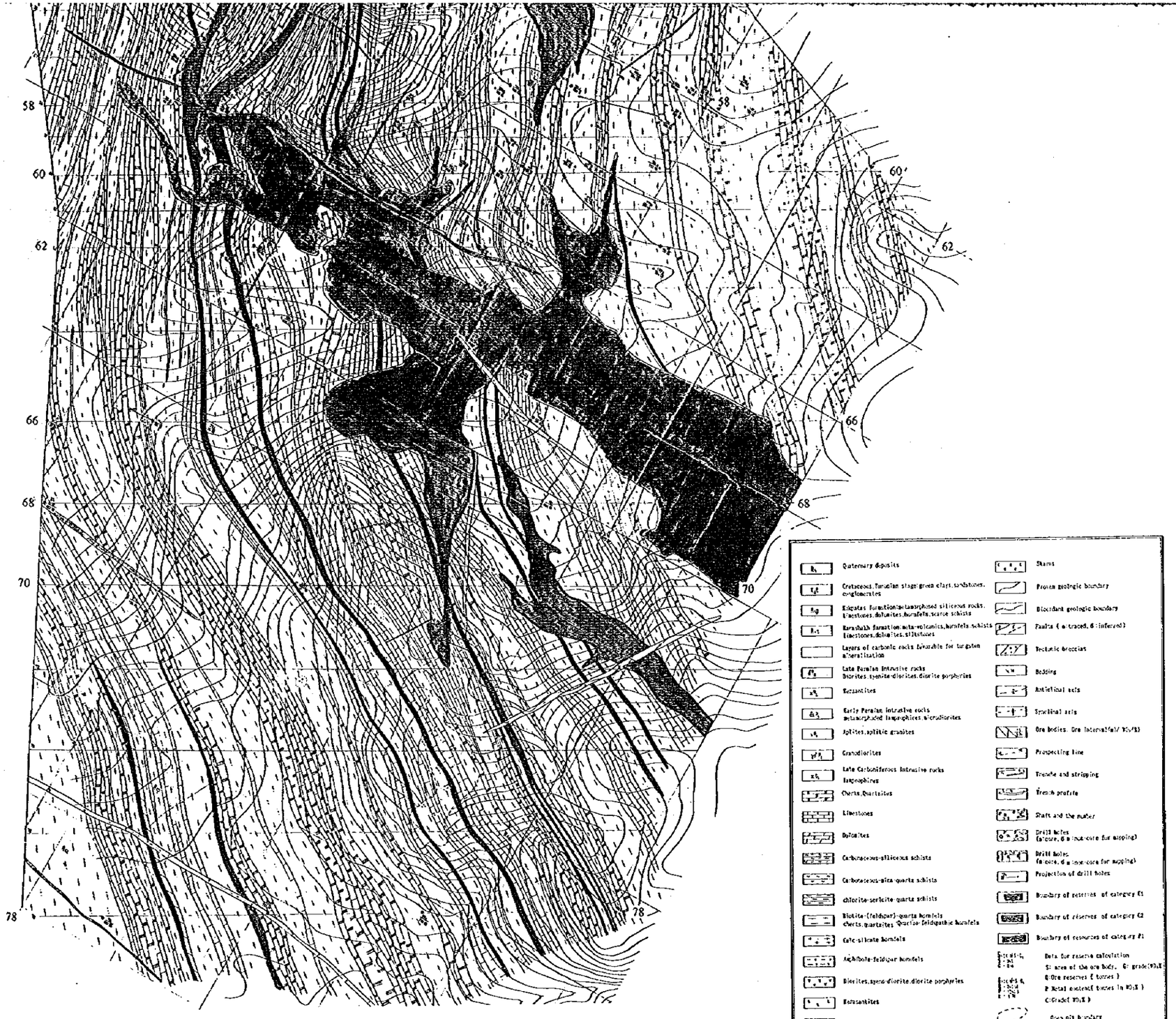
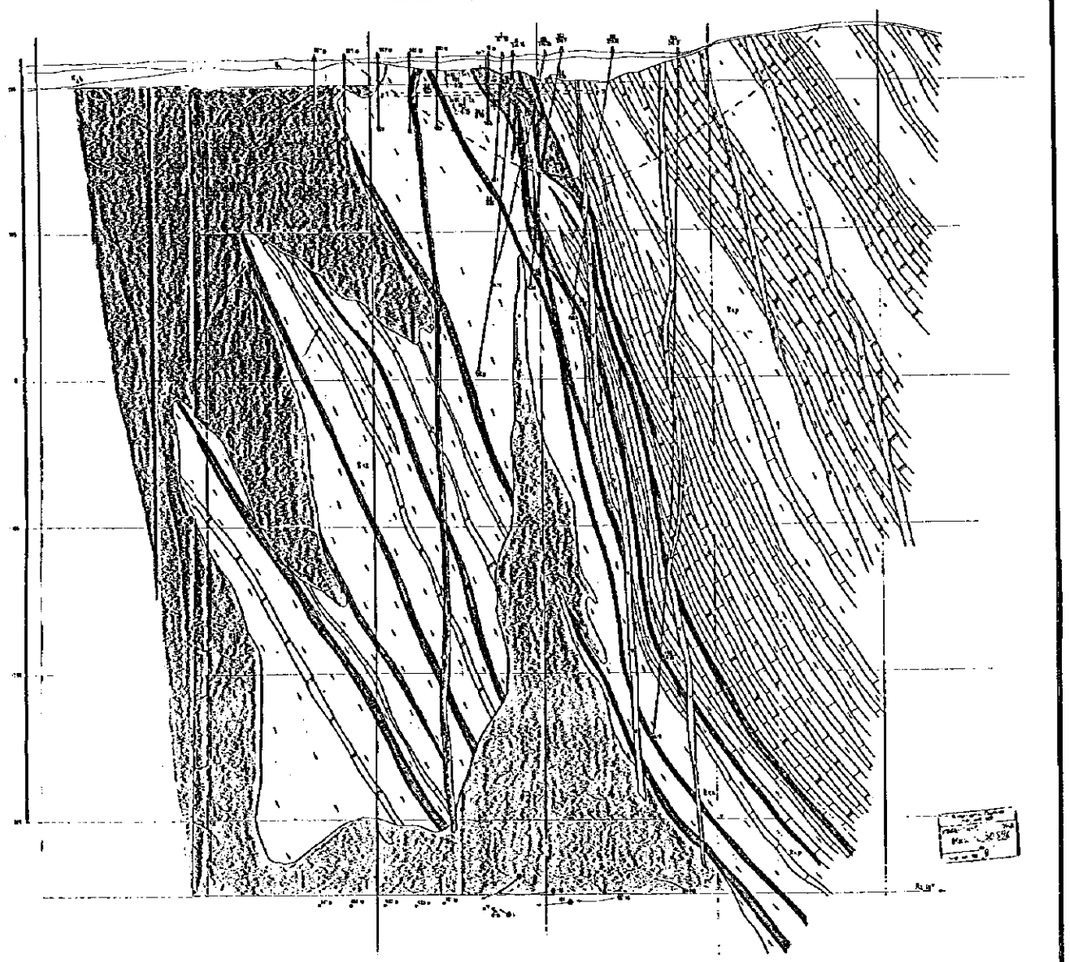

Quaternary deposits
Cretaceous, Turonian stage: green clays, sandstones, conglomerates
limestones, dolomites, hornfels, scarce schists
limestones, dolomites, siltstones
Layers of carbonic rocks favorable for tungsten mineralization
Late Permian intrusive rocks
Diorites, syenite-diorites, diorite porphyries
Skarns
Proven geologic boundary
Faults
Tectonic breccias
Bedding

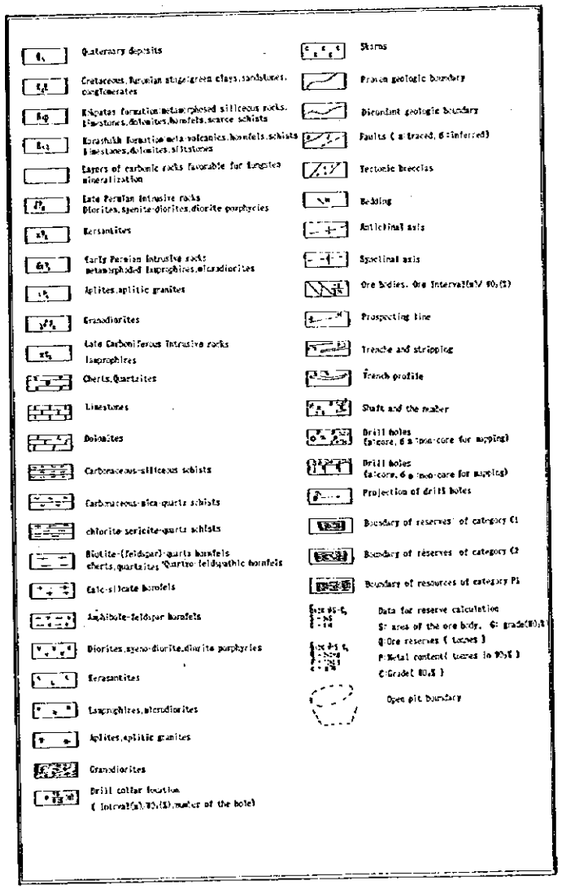


(after V.A. Aleksashechkin: 1993)

LINE 36 — 36



(after V.A. Aleksashechkin; 1993)



THE MINERAL EXPLORATION IN THE EASTERN BUKANTAU AREA THE REPUBLIC OF UZBEKISTAN (PHASE I)

GEOLOGICAL CROSS SECTION (LINE 36-36) OF THE SAUTBAY ORE DEPOSITS

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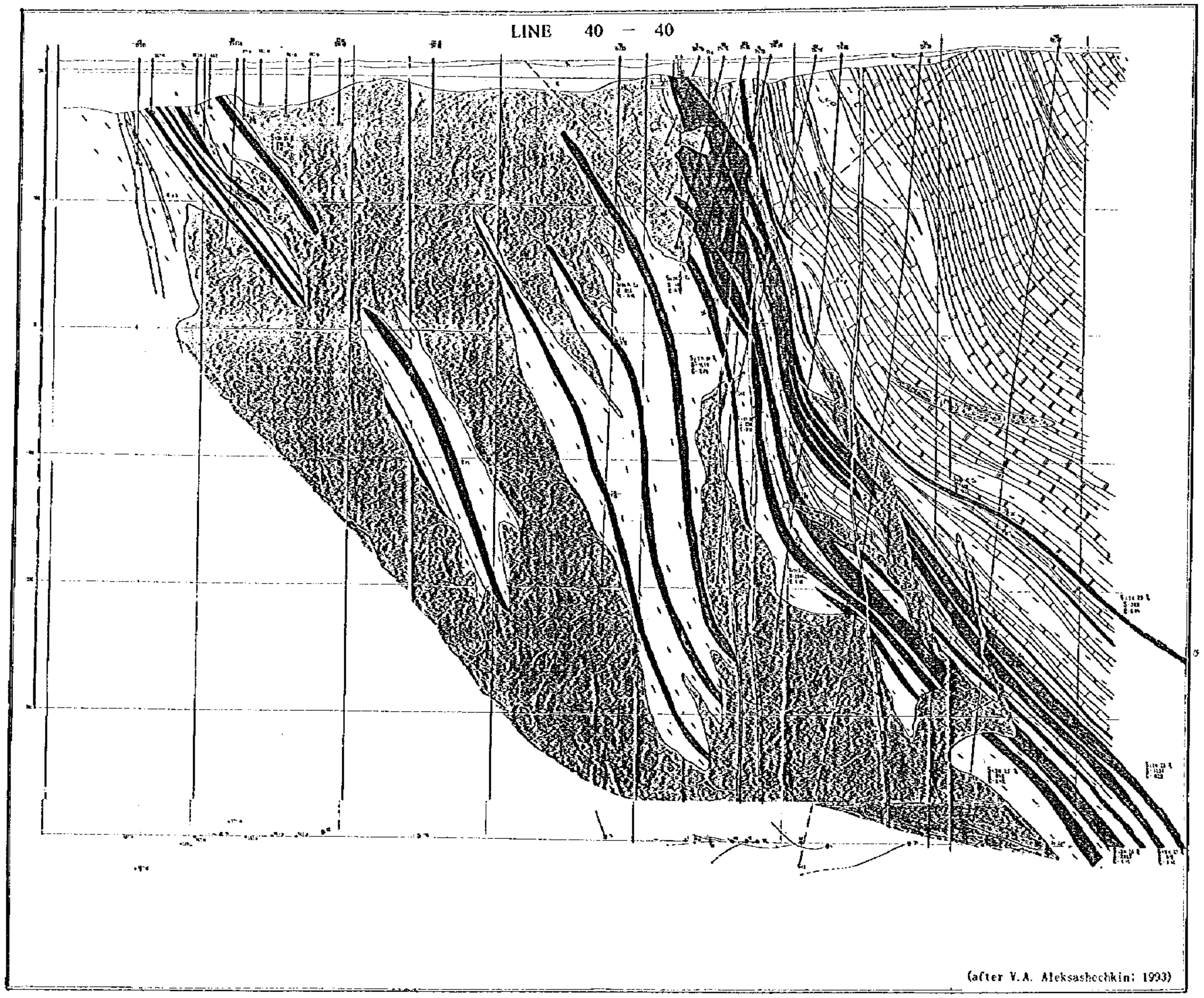


(after V.A. Aleksashechkin; 1993)

Quaternary deposits

Cretaceous Turonian stage: green clays, sandstones, conglomerates

Kapatas formation: metamorphosed siliceous rocks, limestones, dolomites, hornfels, sericite schists

Karashakh formation: meta volcanics, hornfels, schists, limestones, dolomites, siltstones

Layers of carbonic rocks favorable for tungsten mineralization

Late Permian intrusive rocks
Diorites, syenite-diorites, diorite porphyries

Kersantites

Early Permian intrusive rocks
metamorphosed lamprophyres, microdiorites

Aplites, aplitic granites

Granodiorites

Late Carboniferous intrusive rocks
Lamprophyres

Cherts, Quartzites

Limestones

Dolomites

Carbonaceous siliceous schists

Carbonaceous mica-quartz schists

chlorite sericite quartz schists

Biotite (feldspar) quartz hornfels
cherts, quartzites, Quartzo feldspathic hornfels

Calc-silicate hornfels

Amphibole feldspar hornfels

Diorites, syeno diorite, diorite porphyries

Kersantites

Lamprophyres, microdiorites

Aplites, aplitic granites

Granodiorites

Drill collar location
(Interval(m), WO3(%), number of the hole)

Skarns

Proven geologic boundary

Discordant geologic boundary

Faults (a: traced, б: inferred)

Tectonic breccias

Bedding

Anticlinal axis

Synclinal axis

Ore bodies. Ore interval(m)/ [illegible](%)

Prospecting line

Trenche and stripping

Trench profile

Shaft and the number

Drill holes
(a: core, б: non-core for mapping)

Drill holes
(a: core, б: non core for mapping)

Projection of drill holes

Boundary of reserves of category C1

Boundary of reserves of category C2

Boundary of resources of category P1

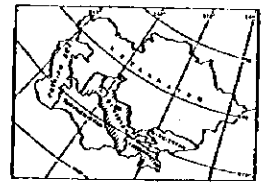
Data for reserve calculation
S: area of the ore body. C: grade(WO3)%
Q: Ore reserves (tonnes)
P: Metal content(tonnes in WO3)
C: Grade(WO3%)

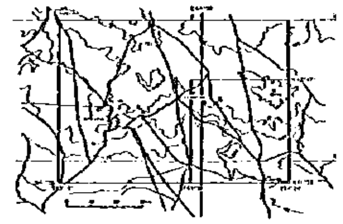
Open pit boundary

PL.I

THE MINERAL EXPLORATION IN THE EASTERN BUKANTAU AREA THE REPUBLIC OF UZBEKISTAN (PHASE I)

GEOLOGICAL CROSS SECTION (LINE 40-40) OF THE SAUTBAY ORE DEPOSITS





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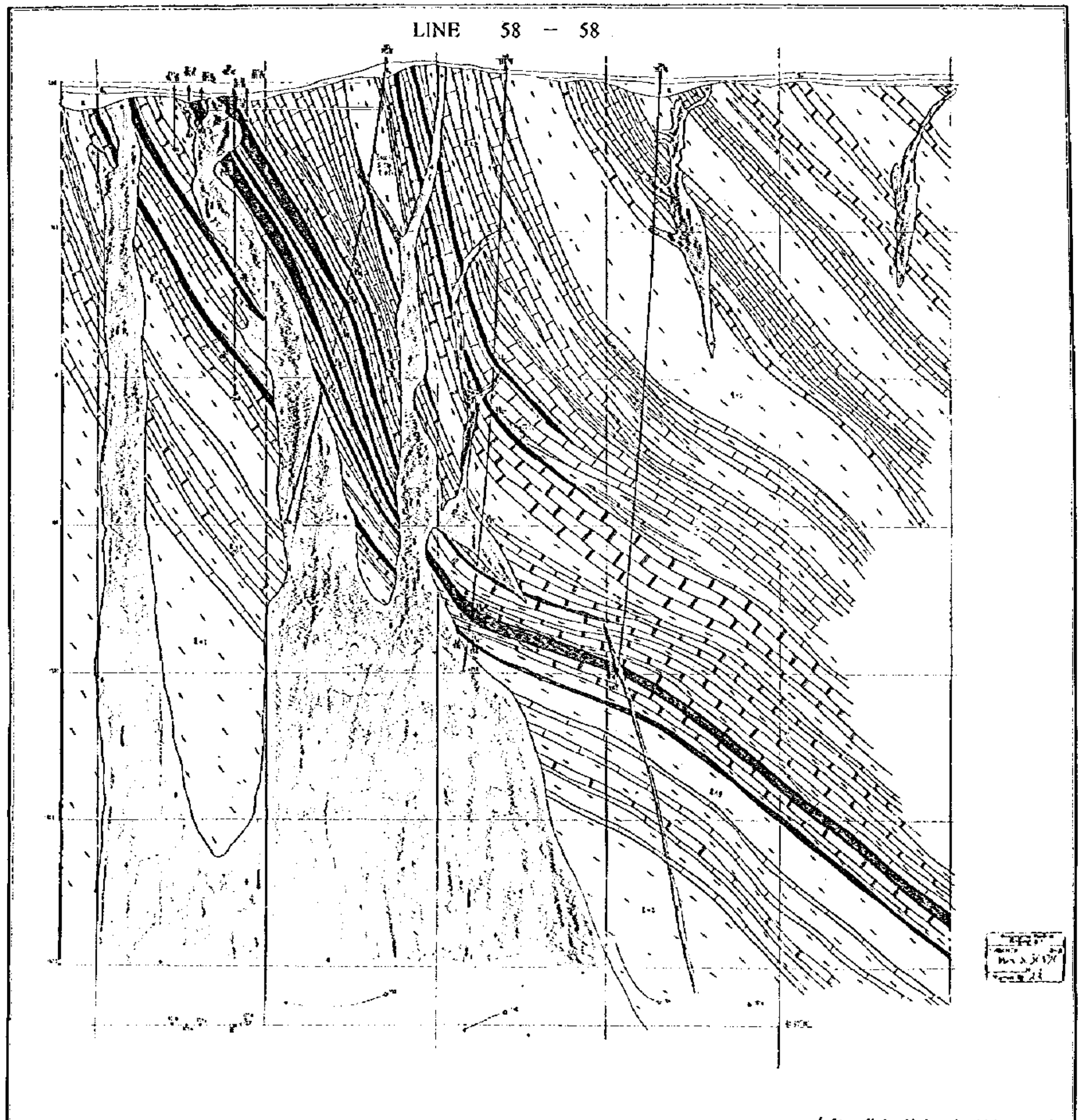
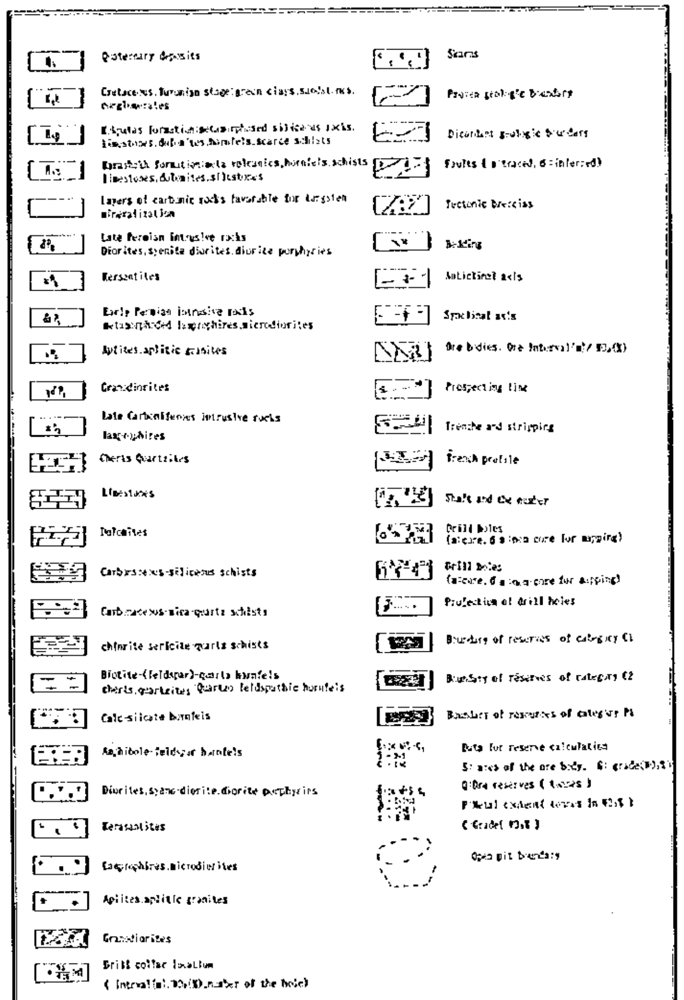


(after V.A. Aleksashechkin: 1993)

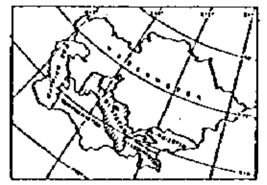


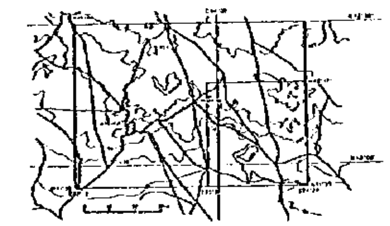
Quaternary deposits
Cretaceous. Turonian stage: green clays, sandstones, conglomerates
Karashokh formation: meta volcanics, hornfels, schists limestones, dolomites, siltstones
Layers of carbonic rocks favorable for tungsten mineralization
Late Permian intrusive rocks
Diorites, syenite diorites, diorite porphyries
Kersantites
Early Permian intrusive rocks
metamorphosed lamprophires, microdiorites
Aplites, aplitic granites
Granodiorites
Late Carboniferous intrusive rocks
lamprophires
Cherts Quartzites
Limestones
Dolomites
Carbonaceous-siliceous schists
Carbonaceous-mica-quartz schists
chlorite sericite quartz schists
Biotite-(feldspar)-quartz hornfels
cherts, quartzites Quartzo feldspathic hornfels
Calc-silicate hornfels
Amphibole-feldspar hornfels
Diorites, syeno-diorite, diorite porphyries
Kersantites
Lamprophires, microdiorites
Aplites, aplitic granites
Granodiorites
Drill collar location
(Interval(m), number of the hole)
Skarns
Proven geologic boundary
Dicordant geologic boundary
Faults (a=traced, б=inferred)
Tectonic breccias
Bedding
Anticlinal axis
Synclinal axis
Ore bodies. Ore Interval(m)/
Prospecting line
Trenche and stripping
Trench profile
Shaft and the number
Drill holes
Projection of drill holes
Boundary of reserves of category C1
Boundary of reserves of category C2
Boundary of resources of category P1
Data for reserve calculation
Q:Ore reserves (tonnes)
Open pit boundary

PL. II-1-4(3)

THE MINERAL EXPLORATION IN THE EASTERN BUKANTAU AREA THE REPUBLIC OF UZBEKISTAN (PHASE I)

GEOLOGICAL CROSS SECTION (LINE 58-58) OF THE SAUTBAY ORE DEPOSITS





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