

第Ⅲ部 結論及び提言

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第1章 結 論

1-1 North & South Ruri Hill 地区

地質・地化探精査を実施した3地区ともに、Ruri Hillのカーボナタイトコーンシートの縁辺部に位置し、地質は基盤のNyanzian変玄武岩とこれを貫くカーボナタイト質岩からなる。地化学探査から3地区ともに、REE、Yは、フェロカーボナタイト又は同質角礫岩に濃集すること、Nbは特定の岩相に規制されず、高含有試料は各地区とも散在し異常帯を形成しないことが判明した。

(1) North Ruri Hill北部地区

フェロカーボナタイト角礫岩は、地区中央部に面積約0.03km²の規模で東西方向に伸びて分布する。岩質は全般に不均質で風化による変質が激しい。REE、Yの地化学異常帯はこの角礫岩体とその周辺のフェロカーボナタイト小岩脈に限定される。しかし、異常帯の中にもこれらの元素の濃度の低い部分があり岩質の不均質性を反映する。

他地区とのコンドライト標準化パターン図での比較から本地区のフェロカーボナタイトは、中～重希土元素の濃集がやや強く、軽希土、特にLaとCeの濃集が弱い。

地質状況および地化学異常帯での元素の濃集状況から、本異常帯にREE、Y等に富む優勢な鉍化帯が賦存する可能性は低いものと判断される。

(2) North Ruri Hill南部地区

フェロカーボナタイトは、地区中央南部に小岩脈群としてまとまって分布し(面積約0.03km²)、また、西部及び南部に岩脈として小数分布する。小岩脈群を形成するものは、幅が数cm～1m、延長が数m～10数mで、アルピカイト、石灰質火砕岩、基盤岩等を貫いている。

地化学異常帯の主なもの、地区の南部に東西に帯状に伸びるY、Th、La+Ce+Ndの異常帯であり、主成分分析の第1主成分のスコアの異常帯に(面積0.06km²)に要約される。

他地区とのコンドライト標準化パターン図での比較から、本地区では、LaとCeの富化が特徴である。

異常帯の面積は比較的大きいが、地質状況から、本地区にはREEに富むまとまりのある岩体が存在する可能性が低い。

(3) South Ruri Hill 地区

フェロカーボナタイトは、岩脈又は小岩脈群として産し、まとまりのあるものは、地区中央～北西部の基盤岩を貫く小岩脈群分布域（面積約0.05km²）である。

地化学異常帯の主なもの、このフェロカーボナタイト岩脈群分布域にあるLa+Ce+Ndの異常帯のみである。

コンドラタイト規格化パターン図の比較から、この異常帯のフェロカーボナタイトは、やや軽希土（La、Ce）に富む程度の性格を示す。

地質状況から、REEに富む優勢な鉍化帯の期待度は低いものと考えられる。

1-2 Kuge-Lwala 地区

(1) Kuge 地区

Kuge Hillは、基盤の変玄武岩とこれを貫く、アルピカイト、フェロカーボナタイトなどからなり、これらカーボナタイト質岩は南西方向に開いた環状構造を示す。

フェロカーボナタイトは、地区の東端部に南北に伸びて分布し、傾斜は60°～80°西傾斜又は垂直、最大幅60m、延長600mに及ぶ。この他、地区の南西部に2つの小岩脈として産す。

地化学探査の結果、Y、Th、La+Ce+Nd、Eu、Ybの異常帯をほぼ総括した形で、第1主成分のスコアの異常帯が地区の東端部と南西端部に分布し、前者はフェロカーボナタイトの分布域にほぼ一致する。後者は、基盤の上の転石帯に現れている。

コンドラタイト規格化パターン図の比較では、本地区のフェロカーボナタイトはNdに富む性質を示す。

地区東端部のフェロカーボナタイトの規模、地化学異常の状況、第1年次の結果を総合すると、本地区のカーボナタイトは、REE、Yの探鉍の対象として有望である。

(2) Lwala 地区

地質は、基盤の変玄武岩とこれを貫く又は覆うカーボナタイト質岩及びフォノライト質岩からなる。初年度の調査結果からREEの鉍化が期待された鉄質角礫岩は、地区の北部に広く分布する。これはカーボナタイト質岩の噴出相と考えられ、フェロカーボナタイト、アルピカイト、変玄武岩等の種々の角礫を含み、基質は酸化鉄鉍物に富む。

地化学異常の主なものは、Y、La+Ce+Nd、Euの異常帯で、これらは、REEの鉍化を表わす第1主成分のスコアの異常帯に要約され、地区の北部に分布する。しかし小規模である。

コンドラタイト規格化パターンの比較から、本異常帯の試料のREEの含有レベルは低く、軽希土の富化が少ないことが挙げられる。

地質調査、地化学調査の結果から、鉄質角礫岩分布域を覆う地化学異常帯における有望なREEの鉱化の期待度は低い。

1-3 Buru Hill 地区

(1) 地質

Buru Hillは、ケニアリフトバレーから分岐したKovirondoリフト内にあり、潜頭性のカーボナタイト貫入岩体とその上にルーフ状に産する破碎基盤岩（モザンビーク変成岩）からなる。カーボナタイトは、主にアルビカイトからなり、僅かにソーバイト及びフェロカーボナタイトを伴う。浅所貫入相と判断される。

Buru Hillの南方にも基盤の低い盛り上がり部があり、珪化した破砕片麻岩が分布する。下部に別のカーボナタイト潜在プラグが存在する可能性がある。

(2) 鉱化作用

Buru HillにおけるREE、Y、Nb等の初生鉱化物質として、カーボナタイト、フェロカーボナタイト、石灰質鉄鉱石、マンガン質鉄鉱石、珪質鉄鉱石が区分される。これらの鉱化物質により、脈状、網状、鉱染状に鉱化をうけ、更に酸化により二次富化をうけた基盤の片麻岩も鉱化物質として重要である。

初生鉱化帯におけるREE及びYを含む鉱物は、大部分弗素（F）を含む炭酸塩鉱物であり、この中でバストネサイトが最も多産する。Nbを含む主な鉱物は、パイロクロアである。一方、二次富化帯におけるこれら元素の賦存状況は十分には解明されていない。

(3) 鉱化帯の状況と品位

鉱化帯は、Buru Hillのほぼ全域に及び（面積約0.2km²）、地表化200mまで連続することが確認された。鉱化帯は地下水位面を境とし、上部の酸化帯と下部の還元帯に分けられ、上部の酸化帯に二次富化作用が認められる。

ボーリングコアの分析結果から、地表下50mまでの平均品位は、La+Ce+Nd：1.93%、Sm+Eu+Tb：0.036%、Yb+Lu：0.0037%、Nb：0.095%、Y：0.065%と推定される。

第2章 第3年次調査への提言

第2年次の調査結果にもとづき、Buru Hill地区における鉍化帯及びKuge-Lwala地区におけるKuge Hillのフェロカーボナタイト分布域をカーボナタイト鉍床賦存の有望地区として抽出した。両地区ともにボーリングによる探鉍と鉍物試験が望ましい。

(1) ボーリング調査

Buru Hill

鉍化帯の範囲を確認し、鉍化帯下部の鉍況を確認する。

Buru Hillの南部に存在する可能性のある潜在カーボナタイトプラグを探查する。

Kuge Hill

フェロカーボナタイト岩脈の北方及び南方延長部の確認と岩脈下部の鉍況の確認。

(2) 鉍物試験

Buru Hill

地表風化帯、二次富化帯及び深部の初生鉍化帯での希土類鉍物賦存の状況を把握し、鉍石から希土類元素、Y等の回収の方法を検討するための鉍物学的試験。

Kuge Hill

フェロカーボナタイト岩脈における希土類鉍物の賦存状況を確認するための鉍物学的試験。

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APPENDIXES

Apx. 2 Results of Whole Rock Analysis of Carbonatites and Related Rocks

Number	Sample Description Depth (G)	Rock Type	SiO ₂ %	Al ₂ O ₃ %	Fe ₂ O ₃ %	MgO %	CaO %	Na ₂ O %	K ₂ O %	TiO ₂ %	P ₂ O ₅ %	MnO %	BaO %	LOI %	TOTAL %	F %
BR-1-A	9.50	Ferrocarnatite	1.45	0.33	37.78	0.16	21.90	0.17	0.05	0.09	2.88	4.36	0.94	19.03	89.15	0.87
BR-1-B	12.40	Ferrocarnatite	1.82	0.37	31.35	0.19	24.57	0.27	< 0.01	0.23	4.30	3.53	1.02	19.52	87.19	1.55
BR-1-C	20.20	Carbonatite	1.21	0.22	13.14	0.15	37.15	0.21	< 0.01	0.03	2.51	6.14	3.29	23.78	87.85	7.18
BR-1-D	27.50	Siliceous ore	12.06	2.98	29.91	1.02	16.88	0.22	1.91	0.47	1.39	4.79	3.79	17.61	92.04	2.13
BR-1-E	38.20	Carbonatite	1.42	0.31	17.55	0.31	29.97	0.36	< 0.01	0.27	6.55	5.86	5.61	18.94	87.17	4.19
BR-2-A	25.50	Ca-Fe-ore	2.47	0.63	43.60	0.25	14.96	0.14	< 0.01	0.05	0.56	7.20	1.65	12.26	83.79	10.60
BR-3-A	8.50	Ca-Fe-ore	1.61	1.17	41.65	0.25	13.11	0.12	< 0.01	0.23	0.96	6.22	6.58	10.51	82.43	9.20
BR-4-A	10.40	Siliceous ore	25.45	0.41	40.36	0.33	5.71	0.15	< 0.01	0.10	0.47	6.68	2.27	10.60	92.55	4.23
BR-4-B	17.00	Siliceous ore	36.62	0.30	25.45	0.13	14.50	0.27	< 0.01	0.22	0.55	3.83	1.22	11.07	94.18	10.10
BR-4-C	45.20	Carbonatite	3.49	0.21	17.26	0.29	31.90	0.23	< 0.01	0.14	1.68	4.47	6.92	22.89	89.50	4.88
BR-5-A	14.80	Mn-Fe ore	5.16	1.35	49.34	0.41	5.54	0.13	0.06	0.06	0.37	10.01	2.17	14.16	88.77	4.10
BR-5-B	31.90	Siliceous ore	34.58	1.49	39.67	0.38	0.88	0.11	0.44	0.38	0.42	1.39	9.22	89.33	0.89	
BR-5-C	50.30	Siliceous ore	29.40	0.46	28.40	0.14	12.32	0.11	< 0.01	0.11	0.28	4.93	3.65	11.60	91.42	9.16
BR-6-A	10.50	Ca-Fe ore	1.36	0.99	43.82	0.27	11.54	0.13	< 0.01	0.01	0.16	10.06	2.58	11.97	82.91	8.46
BR-6-B	18.90	Mn-Fe ore	4.66	2.06	26.87	0.45	4.68	0.12	0.17	0.04	0.53	11.58	14.09	14.56	79.82	4.51
BR-6-C	30.80	Ca-Fe ore	2.57	0.58	46.98	0.24	16.20	0.17	0.24	0.09	0.14	3.06	3.27	6.17	79.72	11.80
BR-6-A	39.45	Ca-Fe ore	3.66	0.49	42.14	0.40	11.45	0.14	0.02	0.10	0.10	6.21	5.23	13.93	83.90	6.70
BR-8-B	45.70	Carbonatite	3.58	0.48	13.43	0.66	37.52	0.22	0.59	0.14	2.97	4.31	1.01	29.35	94.27	1.08
BR-9-A	29.20	Carbonatite	1.17	0.25	24.68	0.18	34.77	0.23	< 0.01	0.09	5.54	2.28	1.04	22.37	92.62	1.42
BR-9-B	35.20	Ferrocarnatite	2.42	0.49	23.20	0.50	22.98	0.20	< 0.01	1.05	2.49	5.55	8.33	17.92	85.15	2.92
BR-10-A	26.10	Carbonatite	1.09	0.24	14.52	0.28	40.75	0.27	< 0.01	0.08	4.86	6.18	1.59	23.06	94.94	4.11
BR-10-B	49.80	Ferrocarnatite	2.22	0.30	36.64	0.25	14.50	0.19	< 0.01	0.19	2.48	7.91	7.51	15.96	88.17	1.85
BR-11-A	38.50	Mn-Fe ore	1.38	0.33	60.02	0.21	0.71	0.12	< 0.01	0.01	0.09	10.08	7.99	9.48	90.44	0.20
BR-11-B	38.90	Carbonatite	0.89	0.13	10.53	0.30	41.10	0.23	< 0.01	0.02	3.53	4.86	2.43	29.58	93.62	1.92
BR-12-A	48.00	Carbonatite	2.49	0.28	12.62	0.27	35.46	0.14	< 0.01	0.09	0.43	4.42	2.98	29.60	88.80	2.92
BR-12-B	50.30	Ferrocarnatite	2.84	0.45	38.23	0.42	14.01	0.12	< 0.01	0.37	0.19	4.94	7.10	13.31	82.00	4.72
BR-13-A	27.20	Mn-Fe ore	3.94	0.81	54.16	0.21	0.72	0.19	0.12	0.09	0.06	13.75	5.15	13.36	92.57	0.40
BR-13-B	32.80	Mn-Fe ore	1.62	0.37	51.11	0.36	5.01	0.10	< 0.01	0.05	0.05	11.24	9.10	13.00	92.01	0.42
BR-13-C	38.50	Carbonatite	2.79	0.18	14.31	0.19	29.49	0.21	< 0.01	0.69	2.84	5.19	9.72	15.04	80.67	9.84
BR-13-D	50.00	Carbonatite	0.98	0.26	32.34	1.11	19.91	0.19	< 0.01	0.17	0.63	6.71	3.67	29.43	95.42	1.93
BR-14-A	9.30	Carbonatite	4.16	0.22	14.78	0.62	27.55	0.13	< 0.01	0.14	0.10	4.77	10.06	24.42	86.97	2.51
BR-15-A	38.80	Mn-Fe ore	3.94	0.25	61.57	0.29	1.56	0.10	< 0.01	0.01	0.09	11.70	2.38	12.89	94.80	1.12
BR-15-B	42.80	Mn-Fe ore	3.85	0.27	55.57	0.79	4.51	0.11	< 0.01	0.01	0.04	11.25	1.56	15.13	93.11	1.13
BRL-1-A	68.10	Mn-Fe ore	1.83	0.26	58.73	0.20	5.39	0.08	< 0.01	0.01	0.26	12.60	1.32	13.17	93.87	0.32
BRL-1-B	74.10	Carbonatite	2.37	0.50	30.13	0.31	18.78	0.17	< 0.01	0.39	2.17	8.40	6.84	14.21	84.29	5.16
BRL-1-C	85.40	Carbonatite	1.29	0.24	33.15	1.07	21.37	0.27	0.11	0.33	3.09	3.43	1.38	25.23	90.97	1.64
BRL-1-E	113.90	Carbonatite	1.15	0.30	21.54	1.40	34.87	0.32	< 0.01	0.15	6.02	2.91	0.47	27.98	97.13	1.19
BRL-1-F	131.30	Carbonatite	1.01	0.23	19.98	1.10	32.21	0.20	< 0.01	0.05	0.12	3.02	1.39	33.25	92.58	3.32
BRL-1-H	198.10	Carbonatite	4.11	0.30	9.02	3.13	34.82	0.30	0.22	0.22	3.45	3.63	2.90	25.95	88.06	3.94
BRL-1-G	180.90	Nephelinite	41.28	11.41	9.25	3.18	11.00	2.49	2.05	1.28	1.23	0.27	2.75	11.02	97.22	0.34
Average	15	Carbonatite	2.14	0.27	17.78	0.89	32.52	0.23	-	0.19	3.05	4.65	3.84	24.51	89.96	3.69
Value by	6	Ferrocarnatite	1.96	0.37	33.31	0.44	19.64	0.19	-	0.35	2.16	5.50	4.76	19.20	87.85	2.31
rock type	5	Ca-Fe ore	2.34	0.77	43.64	0.28	13.45	0.14	-	0.10	0.19	6.55	3.86	10.96	82.55	9.35
(ore)	5	Siliceous ore	27.62	1.13	32.56	0.40	10.06	0.17	-	0.25	0.61	4.13	2.46	12.02	91.90	5.30
	8	Mn-Fe ore	3.30	0.71	52.17	0.37	3.52	0.12	-	0.04	0.19	11.53	5.47	13.22	90.67	1.52

Apx. 3 Summary of Microscopic Observation - Polished Thin Sections -

Sample description		Opaque minerals					Transparent minerals							Und	Remarks *
Number	Depth (m)	Ore type	Goe	Hem	Lep	Mag	Qua	Flu	Bas	Cra	Bar	Non	Cal	Und	Remarks *
BR-2-A	25.50 m	Ca-Fe ore	⊙	△	+			○	+						
BR-3-A	8.50	Ca-Fe ore	○	⊙	△	+	+	△	+	+	+		+		
BR-4-A	10.40	Sil-ore	○	○	△	△	○*	△		+					Opal
BR-4-B	17.00	Sil-ore	⊙	+	+		△*	△	+	+					Opal
BR-4-D	Drill site	Sil-ore	△	+			⊙*	○	△		△	+			Opal > qua
BR-5-B	31.90	Sil-ore	△	○		△	+	○	+		△			△	
BR-5-C	50.30	Sil-ore	⊙	+	+		△*	+		+		+			Opal > qua
BR-6-A	10.50	Ca-Fe ore	⊙	⊙	△			△	+	+	+	+			
BR-6-C	30.80	Ca-Fe ore	○	⊙		○		△	+	+	+				
BR-7-A	Drill site	Sil-ore	⊙	○	+		△	+		+		+			
BR-11-A	38.50	Mn-Fe ore	⊙	⊙	△	△		+	+	△					
BR-15-B	42.80	Mn-Fe ore	⊙	+	+			+				+	△		

⊙ : abundant, ○ : common, △ : poor, + : rare

Abbreviations

- Goe ; goethite, Hem ; hematite, Lep ; lepidocrocite, Mag ; magnetite
- Qua ; quartz, Opal ; chalcedonic quartz
- Flu ; fluorite, Bas ; bastnaesite, Cra ; crandallite group mineral
- Bar ; barite
- Non ; smectite (montmorillonite) group mineral, probably nontronite
- Cal ; carbonate mineral, probably calcite, partly siderite or dolomite
- Und ; undetermined mineral

Ap. 4 Summary of Microscopic Observation - Thin Sections -

Sample description		Opesque minerals										Minerals characteristic in carbonatite										Silicate minerals					Unidentified minerals
Number	Depth (m)	Rock type	Goe	Hem	Mag	Jac	Cal	Sid	Bar	Apa	Flu	Pyc	Bas	Syn	Mic	Ser	Opx	Amp	Sph	CD	AM						
BR-1-A	9.50	Ferro-CB	⊙	△			⊙			○	△																
BR-1-C	20.20	CB	○			⊙ ^{*1}		△					+														
BR-1-E	38.20	CB	○			⊙		○	○	△	○		△														
BR-4-C	45.20	CB	⊙			○		○	△	△	△		+		+												
BR-8-B	45.70	CB	○			⊙				△	+				+												
BR-9-A	29.20	CB				○	○		△	○					+												+
BR-10-A	26.10	CB	△	○	○	⊙		⊙	+	△	○		+														
BR-11-E	38.90	CB	△			⊙		⊙	+	○	△		+		+												
BR-12-B	50.30	Ferro-CB	⊙			△		△		+	+		+														
BR-13-B	32.80	Mn-Fe Ore	⊙	△	△	○		○	△	△																	○
BR-13-D	50.00	CB				⊙ ^{*1}	○	△							+												
BR-14-A	9.30	CB				○		○	+		△		+														
BRL-1-A	68.10	Mn-Fe Ore	⊙			○		○	+				+														
BRL-1-B	74.10	CB	○			⊙		⊙	△	△			+														○
BRL-1-C	85.40	CB				⊙ ^{*1}					△																
BRL-1-D	107.30	CB	△	△		⊙		○	○	△		△			△												
BRL-1-F	131.30	CB				⊙		○	△	△		△			△												
BRL-1-H	198.10	CB				△					△				△												
BRL-1-G	180.00	Nepheleline							△																		
KUGE-A	(Kuge Hill)	Ferro-CB	⊙			⊙		⊙	△				+														△

BR-1 to BR-16 and BRL-1 are DDH No. in Baru Hill Area. Kuge hill is one of sectors of Kuge-Iwala Area.

⊙ : abundant say > 40%, ○ : common say 20 to 40%, △ : poor say 5 to 20%, + : rare say < 5%

Abbreviations

Goe; goethite, Hem; hematite, Mag; magnetite, Jac; jacobsite, Cal; calcite, Sid; siderite, Bar; barite
 Apa; apatite, Flu; fluorite, Pyc; pyrochlore, Bas; bastnaesite, Syn; synchusite, Mic; mica, Ser; serpentine,
 Cpx; clinopyroxene, Amp; amphibole, Sph; sphene, Gb; groundmass, AM; alteration minerals

Remarks

*1 : including Ferric calcite, *2 : feldspar + nepheline, *3 : tridymite and/or calcic edony or zeolite

Ap. 5 Summary of EPMA Test-1, Mineral List Identified by Qualitative Analysis

Sample description			Opaque minerals										Minerals characteristic in carbonatite										Others		Unidentified
Number	Depth(m)	Type	Geo	Hem	Mag	Ilm	Sph	Cal	Do-An	Sid	Str	Bar	Apa	Flu	Pyc	Bas	Syn	Par	Hua	Ran	Mic	Qua	Un-1	Un-2	
BR-1-A	9.50	Ferro-CB	Δ					⊙		Δ		+	○	○	+									+	
BR-1-E	38.20	CB						⊙		○		○	Δ	○		Δ						+			+
BR-9-A	29.20	CB	○		○	Δ		⊙		○			○	○	+							+			
BR-10-A	26.10	CB	Δ					⊙		○		Δ	○	○				Δ		+					○
BR-12-B	50.30	Ferro-CB	⊙		+			Δ			Δ					Δ									Δ
BR-14-A	9.30	CB	○					⊙				○				Δ									Δ
BRL-1-A	68.10	Mn-Fe ore	⊙	○				Δ		Δ															Δ
BRL-1-D	107.30	CB	○		○		Δ	⊙	Δ	○		Δ													
BRL-1-F	131.30	CB						⊙	○	⊙			Δ		Δ										
BRL-1-H	198.10	CB						⊙	○	Δ	Δ	+	Δ						Δ						Δ

⊙; Meior, ○; Common, Δ; Accessory, +; rare
Abbreviations

- Goe; goethite, Hem; hematite, Mag; magnetite, Ilm; ilmenite, Sph; sphalerite
- Cal; calcite, Do-An; dolomite-ankerite mineral, Sid; siderite, Str; strontianite
- Bar; barite, Aps; apatite, Flu; fluorite,
- Pyc; pyrochlore, (Na, Ca, Ce)₂(Nb, Ta, Ti)₂O₆(OH, F)
- Bas; bastnaesite, (Ce, La) (CO₃)₂F
- Syn; synchysite (Ce, La) Ca (CO₃)₂F
- Par; parisite (Ce, La)₂Ca(CO₃)₃F₂
- Hua; huanghoite BaCe(CO₃)₂F
- Ran; rancieite (Ca, Mn²⁺) Mn⁴⁺₈Ca₉·3H₂O
- Mic; mica mineral, sericite except BR-14-A (phlogopite)
- Qua; quartz
- Un-1; probably Ba-rich rancieite
- Un-2; hydrous Al₂O₃

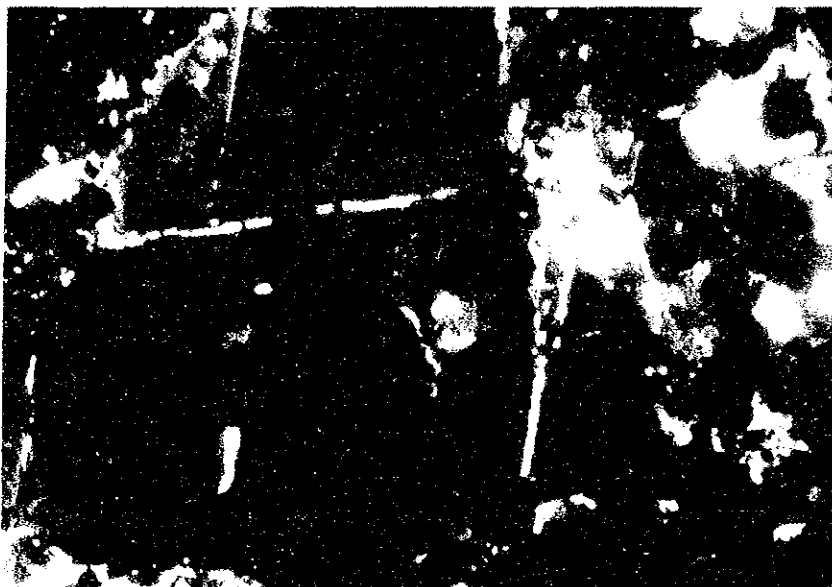
* phlogopite

Apx. 6 Summary of EPMA Test-2, Quantitative Analysis of Minerals

Sample Number	Minerals	Results (weight %)						
		Components	1	2	3	Average		
BR-1-A	Unknown ; probably Barichite Rancieite	MnO	57.96	52.64	58.08	56.23		
		(MnO ₂)	(70.71)	(64.22)	(70.86)	(68.60)		
		BaO	13.26	12.00	12.75	12.67		
		FeO	2.46	7.78	4.33	4.33		
		CaO	2.55	1.86	1.89	2.10		
		Total	(88.98)	(85.86)	(88.24)	(87.69)		
BR-1-E	Bastnäesite	Ce ₂ O ₃	34.27	33.56	33.60	33.81		
		La ₂ O ₃	26.47	25.17	25.07	25.57		
		Nd ₂ O ₃	2.71	4.20	2.57	3.16		
		SrO	1.69	1.54	1.49	1.57		
		CaO	4.19	4.88	4.75	4.61		
		Total	69.33	69.35	67.48	68.72		
BR-9-A	Barite	BaO	65.93	66.72	66.80	66.48		
		SO ₃	33.40	33.04	33.60	33.35		
		CaO	0.50	0.35	0.32	0.39		
		FeO	0.31	0.13	0.17	0.20		
		SrO	0.43	1.40	1.09	0.97		
		Total	100.57	101.64	101.98	101.40		
BR-10-A	Pyrochlore	Nb ₂ O ₅	61.96	61.09	60.64	61.23		
		Ta ₂ O ₅	8.25	10.06	9.71	9.34		
		TiO ₂	5.14	5.00	4.64	4.93		
		Fe ₂ O ₃	1.56	1.08	1.81	1.48		
		CaO	14.32	13.89	14.00	14.07		
		Total	99.47	101.18	99.88	100.18		
BR-12-B	Barite	CaO	8.82	8.94	9.05	8.94		
		Ce ₂ O ₃	30.07	29.02	29.01	29.37		
		La ₂ O ₃	22.30	22.10	22.30	22.23		
		Nd ₂ O ₃	2.24	2.35	2.69	2.43		
		SrO	1.17	1.26	1.56	1.33		
		Total	64.60	63.67	64.61	64.29		
BR-1-A	Barite	CaO	36.05	34.20	34.72	34.99		
		Ce ₂ O ₃	19.33	19.30	19.34	19.32		
		La ₂ O ₃	8.36	7.45	7.97	7.93		
		Nd ₂ O ₃	1.38	1.49	1.48	1.45		
		SrO	2.49	2.28	2.39	2.39		
		Y ₂ O ₃	0.45	0.33	0.00	0.26		
		Total	68.06	65.05	65.90	66.34		
		BaO	67.38	66.16	66.55	66.70		
		SO ₃	34.27	34.36	34.21	34.28		
		CaO	0.00	0.00	0.00	0.00		
		FeO	0.43	0.36	0.39	0.39		
		SrO	0.30	0.58	0.42	0.43		
Total	102.38	101.46	101.57	101.80				
BR-1-E	Strontianite	CaO	4.34	8.35	6.77	6.49		
		SrO	4.22	3.06	3.84	3.71		
		BaO	14.95	8.55	11.93	11.81		
		Ce ₂ O ₃	20.74	21.58	20.80	21.04		
		La ₂ O ₃	21.58	22.43	21.03	21.68		
		Nd ₂ O ₃	2.02	2.01	1.87	1.97		
		Total	67.85	65.98	66.24	66.69		
		BR-1-A	Synchysite	CaO	14.29	15.08	15.01	14.79
				SrO	1.49	1.34	1.56	1.46
				BaO	1.18	0.23	1.47	0.96
				Ce ₂ O ₃	24.80	24.25	25.42	24.82
				La ₂ O ₃	7.00	4.70	6.70	6.13
Nd ₂ O ₃	10.53			11.64	10.73	10.97		
Total	59.29			57.24	60.89	59.14		
BR-1-D	Barite			SO ₃	33.56	34.45	32.85	33.62
				BaO	66.82	66.59	66.48	66.63
				CaO	0.42	0.13	0.08	0.21
				FeO	0.36	0.40	0.46	0.41
				SrO	0.48	0.31	0.27	0.35
		Total	101.64	101.88	100.14	101.22		
		BR-1-F	Pyrochlore	Nb ₂ O ₅	61.06	61.34	59.78	60.73
				Ta ₂ O ₅	9.27	9.88	10.23	9.79
				TiO ₂	4.82	4.41	4.56	4.60
				Fe ₂ O ₃	0.77	0.62	0.70	0.70
				CaO	13.98	14.45	13.97	14.13
				Nb ₂ O ₅	8.48	7.30	9.54	8.44
Total	98.38			98.00	98.78	98.38		
BR-1-H	Huanghoite Synchysite			SrO	62.16	65.94	66.72	64.94
				CaO	8.09	5.90	4.69	6.23
				Total	70.25	71.84	71.41	71.17
				CaO	4.34	8.35	6.77	6.49
				SrO	4.22	3.06	3.84	3.71
		BaO	14.95	8.55	11.93	11.81		
		Ce ₂ O ₃	20.74	21.58	20.80	21.04		
		La ₂ O ₃	21.58	22.43	21.03	21.68		
		Nd ₂ O ₃	2.02	2.01	1.87	1.97		
		Total	67.85	65.98	66.24	66.69		



(in reflecting light, open)



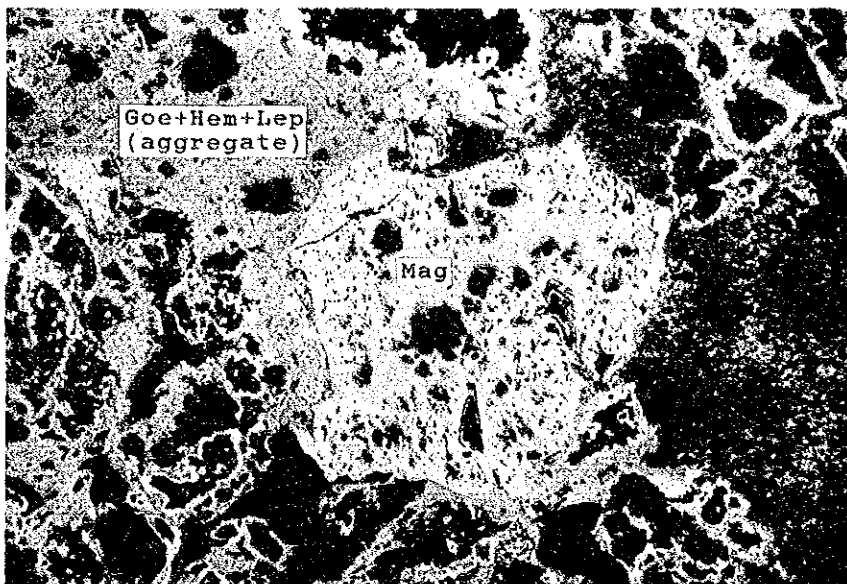
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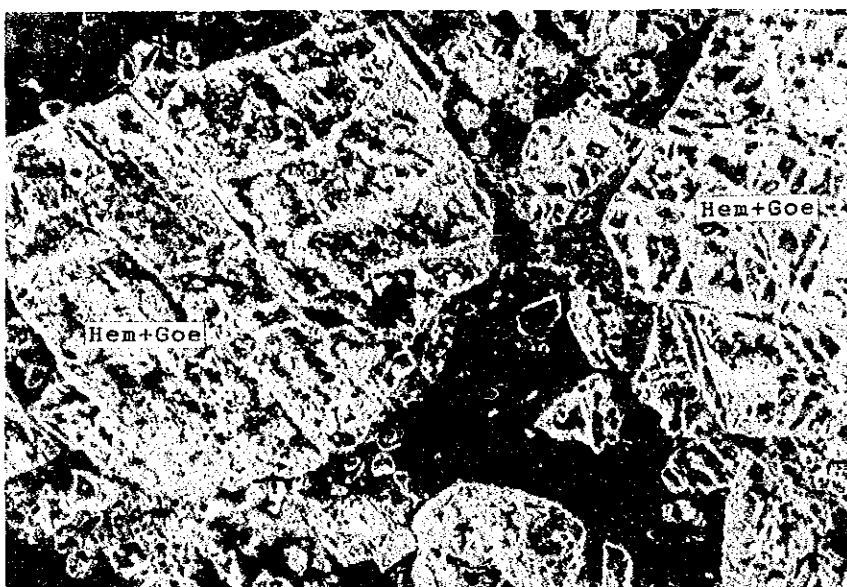
Goe : Goethite
Hem : Hematite
Lep : Lepidocrocite

Boring No. : BR-2
Sample No. : BR-2-A
Depth : 25.50m
Ore name : Calcareous iron ore

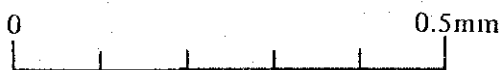
Apx. 7 Microphotographs (Under Polished Thin Sections)



(in reflecting light, open)



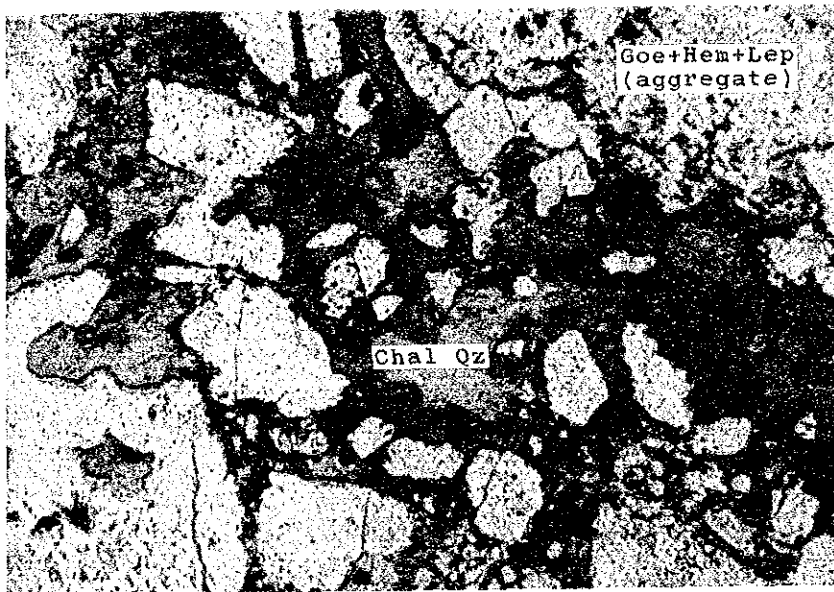
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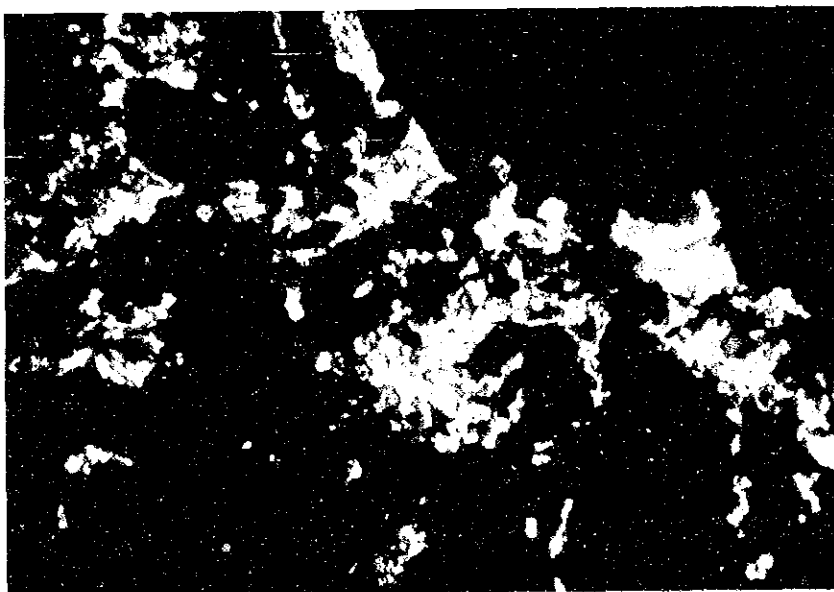
Mag : Magnetite
 Goe : Goethite
 Hem : Hematite
 Lep : Lepidocrocite

Boring No. : BR-4
 Sample No. : BR-4-A
 Depth : 10.40m
 Ore name : Siliceous ore

Apx. 7 Microphotographs (Under Polished Thin Sections)



(in reflecting light, open)



(under crossed polars)



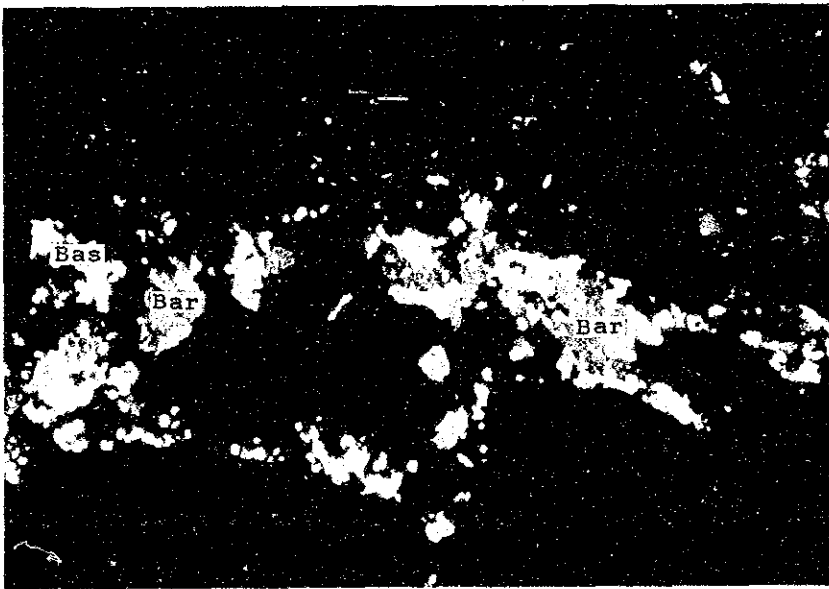
Goe : Goethite
 Hem : Hematite
 Lep : Lepidocrocite
 Chal Qz : Chalcedonic Quartz

Boring No. : BR-5
 Sample No. : BR-5-C
 Depth : 50.30m
 Ore name : Siliceous ore

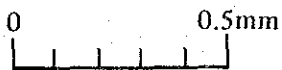
Apx. 7 Microphotographs (Under Polished Thin Sections)



(in reflecting light, open)



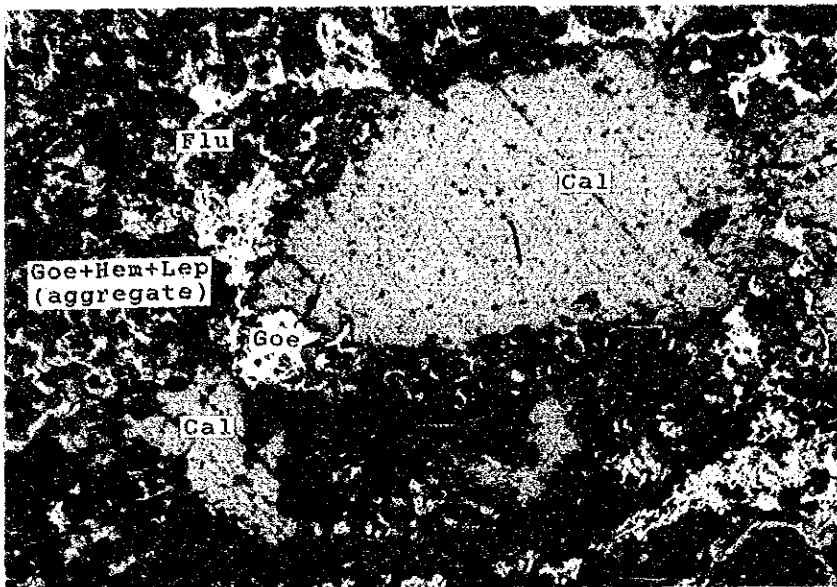
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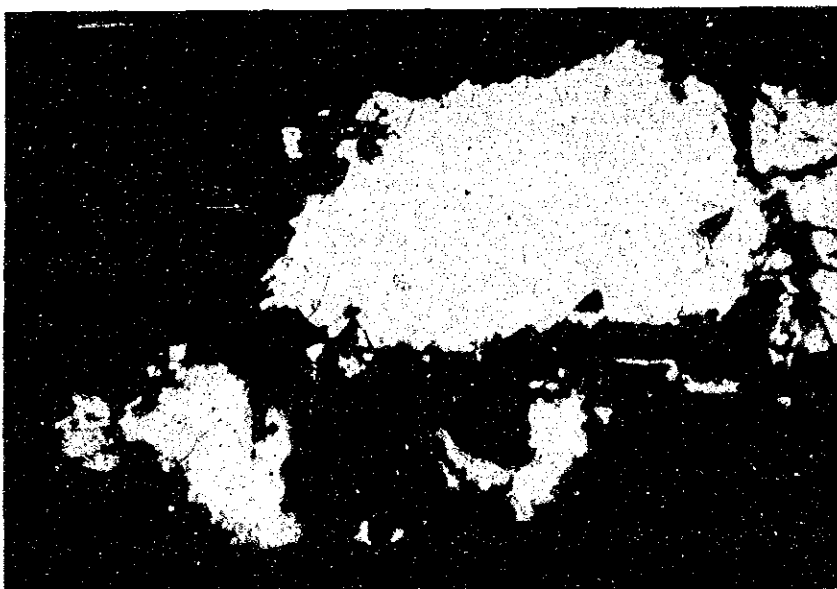
Goe : Goethite
 Hem : Hematite
 Bas : Bastnaesite
 Bar : Barite

Boring No. : BR-6
 Sample No. : BR-6-A
 Depth : 10.50m
 Ore name : Calcareous iron ore

Apx. 7 Microphotographs (Under Polished Thin Sections)



(in reflecting light, open)



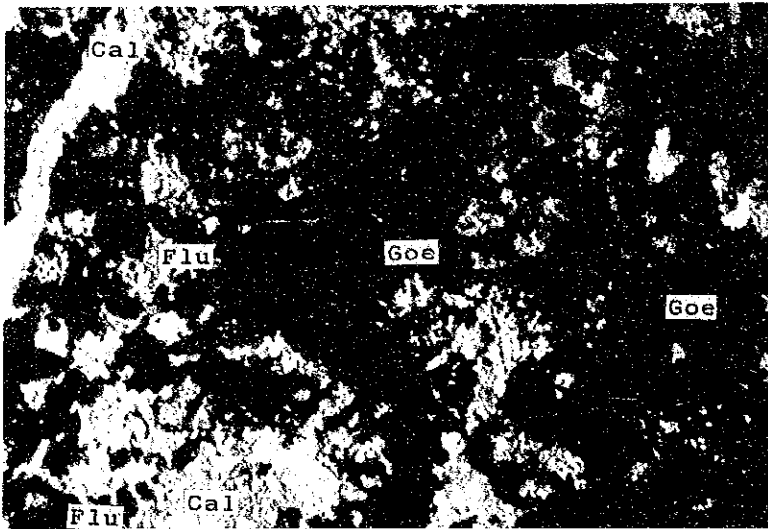
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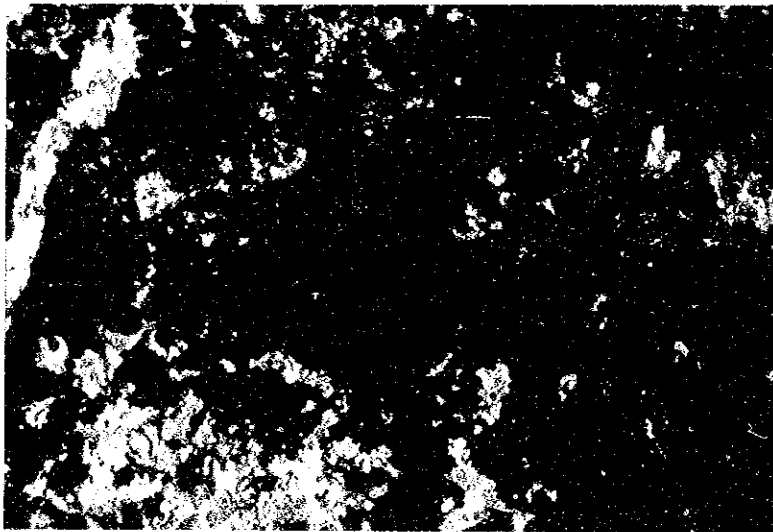
Cal : Calcite
 Flu : Fluorite
 Goe: Goethite
 Hem: Hematite
 Lep: Lepidocrocite

Boring No. : BR-15
 Sample No.: BR-15-B
 Depth : 42.80m
 Ore name : Manganiferous iron ore

Apx. 7 Microphotographs (Under Polished Thin Sections)



(in plane-polarized light)



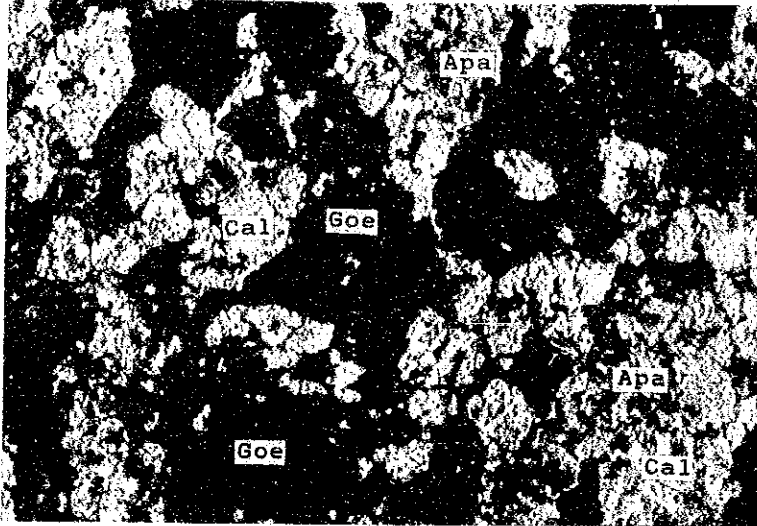
(under crossed polars)

0 1mm

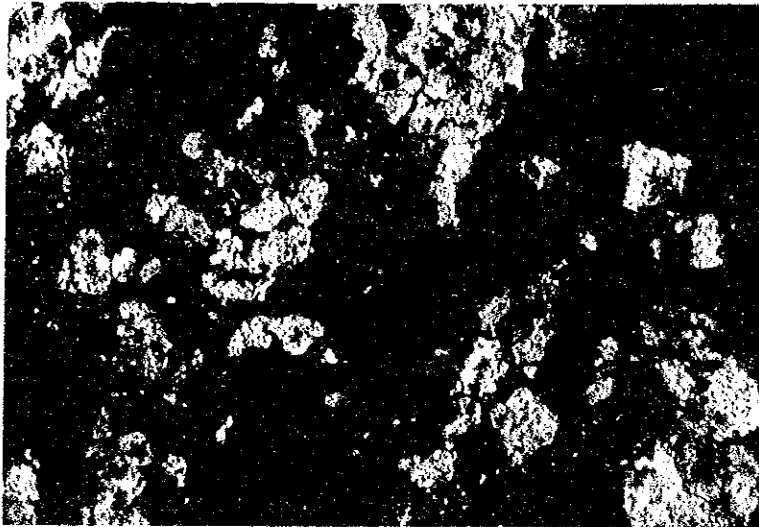
Cal : Calcite
Goe: Goethite
Flu : Fluorite

Boring No. : BR-1
Sample No. : BR-1-E
Depth : 38.20m
Rock name : Carbonatite

Apx. 8 Microphotographs (Under Thin Sections)



(in plane-polarized light)



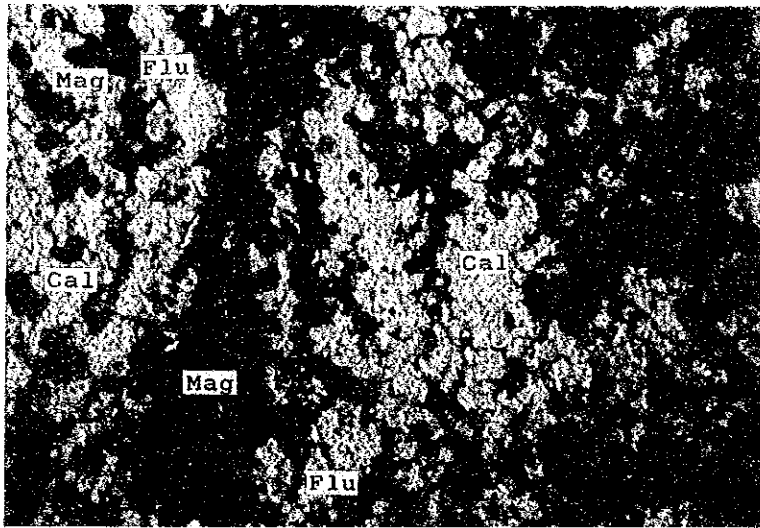
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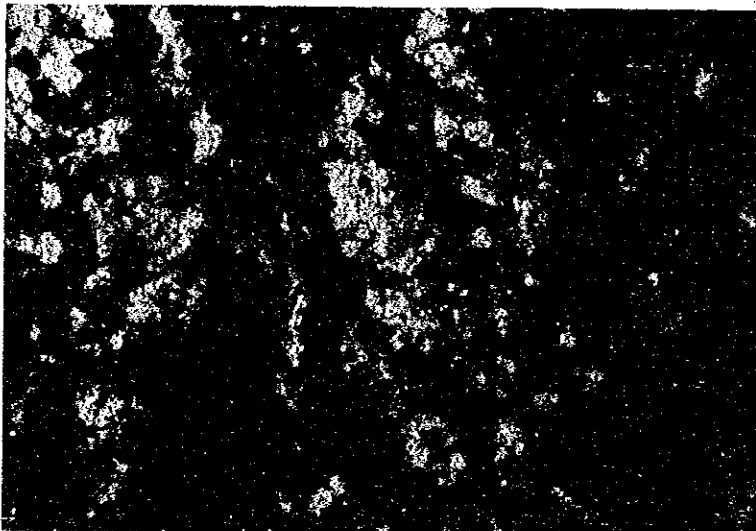
Cal : Calcite
Goe: Goethite
Apa: Apatite

Boring No. : BR-11
Sample No.: BR-11-B
Depth : 38,90m
Rock name : Carbonatite

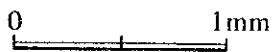
Apx. 8 Microphotographs (Under Thin Sections)



(in plane-polarized light)



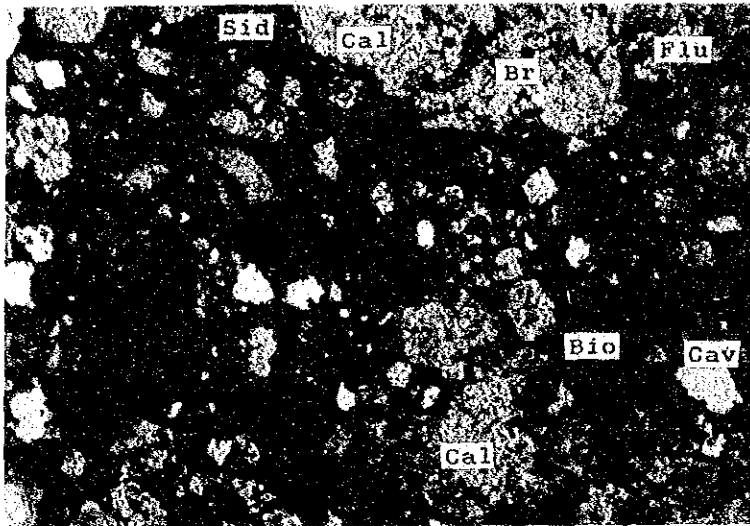
(under crossed polars)



Cal : Calcite
Mag: Magnetite
Flu: Fluorite

Boring No. : BRL-1
Sample No.: BRL-1-C
Depth : 85.40m
Rock name : Banded carbonatite

Apx. 8 Microphotographs (Under Thin Sections)



(in plane-polarized light)



(under crossed polars)



Br : Breccia of carbonatite
 Cal : Calcite
 Sid : Siderite
 Flu : Fluorite
 Bio : Biotite
 Cav : Cavity

Boring No. : BRL-1
 Sample No.: BRL-1-F
 Depth : 131.30m
 Rock name: Brecciated carbonatite

Apx. 8 Microphotographs (Under Thin Sections)

Apx. 9 Microscopic Observation of Ores under Polished Thin Sections

BR - 2 - A: goethite - fluorite rock

Aggregates of goethite (ca. 0.1mm in size) and hematite with a less amount of lepidocrocite (ca. 0.1mm in size) are predominant. Hematite occurs as irregular masses up to 5 mm in diameter enclosed with goethite-lepidocrocite aggregates. Lepidocrocite, lighter and whiter than goethite and more greenish than hematite, usually occurs as thin plates or tabular crystals in goethite masses.

BR - 3 - A: hematite - goethite rock

Hematite composed of an aggregate of irregular shape with goethite and lepidocrocite, sometimes occurs as acicular crystals up to 0.2mm in length in goethite-rich portion of the aggregate. Hematite-goethite-lepidocrocite aggregate occasionally contains magnetite in irregular shape up to 0.2mm as a remainder after incomplete replacement. This means that hematite replaced magnetite ("martitization") and, goethite and lepidocrocite replaced hematite ("limonitization") probably as a result of weathering.

Fluorite (<2mm X 2mm), bastnaesite (<1mm), crandallite group mineral (<0.1mm), barite (0.2mm X 0.1mm, subhedral) and carbonate mineral, probably calcite (0.2mm, euhedral - subhedral) occupy irregular interspaces. Some grains of fluorite show purple color.

BR - 4 - A: goethite - hematite - chalcedonic quartz rock

Aggregates composed of fine grains of goethite, hematite and less lepidocrocite form a dendritic texture or framboid-like texture, and sometimes occur as a replacement texture of originally short prismatic crystals, maybe magnetite, ranging from 0.1mm to 2mm in size. Hematite often occurs as veinlets 0.02mm - 0.1mm in width. Magnetite grains in irregular shape up to 0.2mm X 0.2mm were incompletely replaced by small grains of hematite. Most of quartz is chalcedonic and associated with smectite (montmorillonite) group mineral, probably nontronite and crandallite group mineral (<0.04mm X 0.1mm, euhedral). Nontronite occurs as microscopic aggregates of finely fibrous or bladed flakes in greenish to brownish color. Fluorite forms an aggregate of many grains up to 0.1mm.

Apx. 9 Microscopic Observation of Ores under Polished Thin Sections

BR - 4 - B: goethite rock

Opaque minerals form aggregates of fine grains of goethite (<0.1mm) and less amounts of hematite and lepidocrocite. Brecciated massive hematite (<0.2mm X 0.2mm) is commonly observed. Aggregates of bastnaesite (<0.05mm, aggregates of acicular crystals), crandallite group mineral (<0.2mm, subhedral - anhedral), nontronite (dusty aggregates), fluorite and chalcedonic quartz occur in irregular interspaces or veinlets.

BR - 4 - D: chalcedonic quartz - fluorite rock

This is composed of chalcedonic quartz (0.05mm - 0.1mm), bastnaesite (<0.05mm), barite (<0.05mm X 0.1mm, subhedral), fluorite, goethite and hematite. Veinlets of chalcedonic quartz up to 0.5mm in width are commonly observed. Hematite and goethite occasionally occur as pseudomorphs of magnetite grains up to 2mm X 2mm.

BR - 5 - B: hematite - fluorite rock

Some aggregates of hematite and goethite occur as pseudomorphs (0.04mm X 0.04mm - 1mm X 1mm) of magnetite. Magnetite is often observed as relict masses in the aggregates. Dendritic texture with quartz are also common in hematite and goethite. Fluorite (<2mm X 2mm), barite (<0.2mm, anhedral), quartz (ca. 0.1mm, anhedral), bastnaesite (ca. 0.05mm, aggregates) and an undetermined mineral occur as an interstitial minerals among the opaque iron minerals.

The undetermined mineral is optically similar to biotite, however, its optical orientation is often perpendicular to that of biotite.

BR - 5 - C: goethite rock

Goethite and small amounts of hematite and lepidocrocite form aggregates up to 1mm X 1.5mm. In the matrix of the aggregates occur chalcedonic quartz, brownish aggregates of minute crystals of nontronite, purple fluorite up to 0.1mm and anhedral crystals of crandallite group mineral up to 0.1mm X 0.04mm. Chalcedonic quartz commonly occurs as veinlets 0.4mm - 1.5mm wide.

Apx. 9 Microscopic Observation of Ores under Polished Thin Sections

BR - 6 - A: goethite - hematite rock

Forms of aggregates composed of goethite, hematite and lepidocrocite suggest that they occurred as pseudomorphs of magnetite. They are also observed as a dendritic texture.

Fluorite (<0.2mm X 0.2mm in most cases, but rarely <3mm X 1mm, anhedral), brownish bastnaesite (0.05mm), crandallite group mineral (0.05mm - 0.2mm), barite (<0.3mm X 0.2mm, subhedral) with cleavage and greenish to brownish nontronite (<0.8mm X 0.4mm) occur in the matrix of the opaque iron minerals. Bastnaesite occasionally includes barite grains, and occurs as a network in the opaque minerals.

BR - 6 - C: hematite - goethite - magnetite rock

Anhedral minute grains of hematite (<1.2mm X 0.5mm), goethite, magnetite (<0.05mm, partly subhedral) are usually observed as aggregates. In the matrix of the aggregates occur partly purple-colored fluorite, crandallite group mineral (<0.2mm X 0.2mm, anhedral), brownish bastnaesite, barite (<0.5mm X 0.3mm, anhedral).

BR - 7 - A: goethite - hematite rock

This is composed of aggregates of goethite, hematite and lepidocrocite up to 0.6mm X 0.4mm and the matrix of chalcedonic quartz, fluorite, nontronite and crandallite group mineral.

BR - 11 - A: goethite - hematite rock

Goethite, hematite and lepidocrocite generally occur as an aggregate. Magnetite occasionally occurs as a relict up to 0.05mm in hematite. Fluorite (<0.03mm), crandallite group mineral (<0.4mm) and bastnaesite (<0.02mm) are observed in the matrix. Bastnaesite usually occurs near the boundary between fluorite and crandallite group mineral.

BR - 15 - B: goethite rock

Aggregates of goethite, hematite and lepidocrocite up to 1mm X 1mm seem to be oxidation products of euhedral to subhedral grains of magnetite. Interstitial fluorite, nontronite and carbonate mineral (<2mm X 1mm, probably calcite, partly siderite?) also occur.

Apx. 10 Microscopic Observation of Rocks under Thin Sections

BR - 1 - C: carbonatite

This is an altered fine grained carbonatite, containing Fe-rich calcite sets in a calcite matrix, fluorite as massive aggregates or inclusions in opaque phases and baryte as thin veinlets associated with fine grained calcite. XRD indicates that the opaque mineral is goethite.

X-ray determinations; calcite, fluorite, goethite, bastnaesite(?)

BR - 1 - E: ferrocarnatite

This is a fine to medium grained ferrocarnatite, containing fluorite, barite, opaque minerals, apatite and bastnaesite. Fine grained bastnaesite occurs as small inclusions in the opaque mineral phases. Fluorite, baryte and apatite occur as aggregates. The opaque mineral is goethite.

X-ray determinations; calcite, bastnaesite, fluorite, F-apatite, baryte, goethite.

BR - 4 - C: carbonatite

This is a medium grained carbonatite, containing a large amounts of goethite associated with fluorite, calcite and baryte. Baryte and fluorite occur as inclusions in the opaque minerals. A rare mica and a cryptocrystalline aggregate of apatite are also present.

X-ray determinations; calcite, fluorite, goethite, bastnaesite(?)

BR - 8 - B: carbonatite

This is a fine grained altered carbonatite with goethite veinlets in a calcite matrix. Apatite occurs as a cryptocrystalline aggregate. Fluorite and a rare mica are also present.

X-ray determinations; calcite, goethite, apatite, fluorite.

BR - 9 - A: ferrocarnatite

This is a very fine grained opaque rich ferrocarnatite in which opaque minerals of hematite and magnetite occur as veinlets along the grain boundaries of calcite. Also fine grained fluorite and an unidentified mineral occur in the calcite matrix. The unidentified mineral is cubic (isotropic) and shows a relatively high reflective

Apx. 10 Microscopic Observation of Rocks under Thin Sections

index and it is probably pyrochlore. Apatite crystal aggregates are present adjacent to the opaque minerals.

X-ray determinations; calcite, hematite, magnetite, fluorite, apatite.

BR - 10 - A: ferrocarnatite

This is a fine grained ferrocarnatite, containing euhedral grains of fluorite (up to 0.5mm diameter) occurring in a slightly altered (oxidized) calcite matrix, opaque minerals (hematite, magnetite) which are partly altered to goethite, a brown fine grained aggregate of probably apatite and a minor baryte content. Bastnaesite is not optically identified here.

X-ray determinations; calcite, fluorite, goethite, apatite, bastnaesite, hematite, magnetite.

BR - 11 - B: carbonatite

This is a fine to medium grained carbonatite with opaque minerals which are almost entirely replaced by goethite, brown cryptocrystalline materials (a mixture of apatite and unknown substance) together with the opaque minerals, rounded grains of fluorite in a calcite matrix, a rare mica and baryte. Bastnaesite could not be identified optically, although its presence is suggested by the X-ray diffraction method.

X-ray determinations; calcite, apatite, fluorite, goethite, baryte, mica, bastnaesite.

BR - 12 - B: iron-rich carbonatite

This rock is composed dominantly of iron-oxide (now goethite) and a small amount of calcite, apatite, fluorite, bastnaesite (?) and an unidentified Al-P-mineral. Bastnaesite is present within the opaque minerals as small grains. The unidentified Al-P-mineral is brown in colour under plane polarized light, isotropic and with a higher refractive index than that of calcite. This mineral is present as a euhedral tabular crystal (seems to be a pseudomorph after an unknown pre-existing mineral) or massive aggregates associated with the opaque minerals. EPMA analysis (major elements) indicates that this mineral contains Al_2O_3 and P_2O_5 but no Si or Ti also Ca, Mn, Fe, Na, K, Mg were

Apx. 10 Microscopic Observation of Rocks under Thin Sections

detected, suggesting that this may be a REE bearing Al_2O_3 - P_2O_5 mineral such as florencite. The XRD analysis, however, does not suggest any presence of such a REE-bearing mineral, but indicates the presence of goethite, fluorite, hematite, calcite, and possibly bastnaesite (The unidentified phase is metamict). Fluorite occurs as a grain aggregate in the opaque mineral rich areas. Compared with the other samples, this sample contains a relatively small amount of calcite.

X-ray determinations; calcite, opaque minerals fluorite, apatite, Al-P-unidentified phase.

BR - 13 - B: brecciated ferrocarnatite

This is a brecciated ferrocarnatite containing opaque minerals in a calcite matrix. Late stage calcite-baryte veins are evident. Baryte also occurs as inclusions in the opaque minerals. The opaque minerals are hematite, magnetite and goethite. A small amount of an unidentified mineral, brown in colour, euhedral cubic crystal, is also present in the calcite matrix.

X-ray determinations; calcite, baryte, goethite, hematite, magnetite, apatite (?).

BR - 13 - D: brecciated carbonatite

This rock consists of calcite, iron-rich calcite and siderite set in a carbonate matrix. Late stage baryte veinlets are also present. XRD suggests a presence of synchysite which could not be identified under optical observation.

X-ray determinations; calcite, siderite, baryte, synchysite.

BR - 14 - A: brecciated ferrocarnatite

This rock is composed of calcite, fluorite, baryte, opaque minerals and possibly bastnaesite. A brown isotropic crystal aggregate (unidentified) occurs as a dominant phase. EPMA analysis indicates a presence of a Mn-Fe oxide mineral.

X-ray determinations; calcite, fluorite, bastnaesite, baryte.

Apx. 10 Microscopic Observation of Rocks under Thin Sections

BRL - 1 - A: ferrocarbonatite

This rock is extremely altered, consisting dominantly of opaque mineral (hematite) and calcite together with synchysite and baryte. A brown cryptocrystalline mineral aggregate (unidentified) is present as a major constituent phase.

X-ray determinations; calcite, hematite, synchysite.

BRL - 1 - B: ferrocarbonatite

This rock is fine grained, consisting dominantly of hematite and calcite together with a small amount of baryte, fluorite and an unidentified isotropic crystal aggregate.

X-ray determinations; calcite, fluorite, baryte, hematite, bastnaesite.

BRL - 1 - C: carbonatite

This rock is medium grained and composed of calcite, iron-rich calcite, fluorite, hematite and magnetite. A small amount of an unidentified mineral in tiny cubic brown crystals is present in a calcite matrix.

X-ray determinations; calcite, fluorite, magnetite, hematite.

BRL - 1 - D: carbonatite

This is fine to medium grained carbonatite, consisting dominantly of calcite and siderite together with a small amount of hematite and magnetite, and a small amount of a rare mica, baryte, serpentine and pyrochlore. The pyrochlore is cubic reddish brown with euhedral crystals set in a calcite matrix.

X-ray determinations; calcite, siderite, hematite, pyrochlore (?).

BRL - 1 - F: brecciated carbonatite

This is a brecciated carbonatite with a fine dark carbonatitic matrix (siderite-rich). An opaque mineral is present or an accessory. A large (up to 3mm in diameter) carbonatite breccia (aggregate of fine euhedral grain of calcite) is present. Accessory phases are mica, baryte, fluorite and pyrochlore like phase, all of them are present in a fine grained siderite-rich matrix.

X-ray determinations; calcite, siderite, fluorite.

Apx. 10 Microscopic Observation of Rocks under Thin Sections

BRL - 1 - H: carbonatitic breccia

This is extremely altered fine grained carbonatitic breccia with a Mn-Fe rich calcite matrix and a small amount of an opaque mineral. XRD indicate a presence of jacobsite. Accessory phases are fluorite and synchysite. The latter is only identified by XRD.

X-ray determinations; calcite, jacobsite, fluorite, synchysite.

BRL - 1 - I: melanephelinite or nephelinite

This is extremely altered basic to intermediate volcanic rock, possibly melanephelinite or nephelinite. Phenocryst minerals are euhedral prismatic clinopyroxene (ferro aegirine augite), hornblende, apatite, sphene, and possibly feldspar(?) and nepheline set in a altered groundmass. The groundmass consists of extremely fine grained chalcedony (?), chlorite and possibly zeolite. An opaque mineral is rare. Feldspar(?) and nepheline are entirely replaced by trydimite (?) and/or chalcedony (or zeolite).

KUGE - A: ferrocarnatite

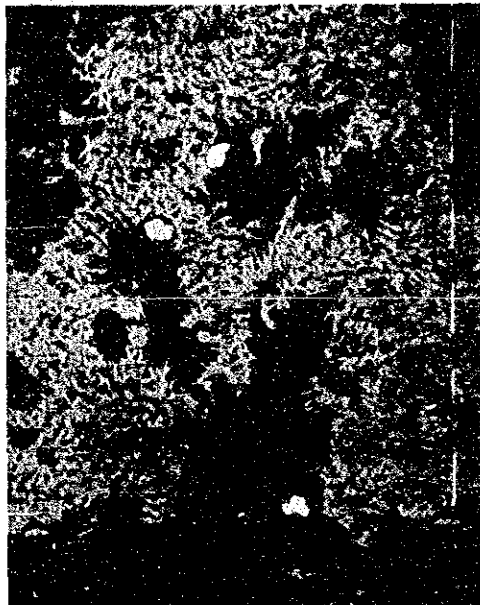
This is opaque mineral rich fine grained ferrocarnatite, which is extremely altered, consisting of calcite, baryte, goethite, bastnaesite (?) and mica. A late stage of carbonate veinlets is present. Reddish brown fibrous serpentine-like phase occurs as a fibrous radiated crystal aggregate (up to 50 μm in diameter). EPMA indicates that carbonate minerals are calcite, Fe-rich calcite, and Fe-Mn-rich calcite. An opaque mineral is now entirely composed of goethite.

X-ray determinations; calcite, baryte, goethite, bastnaesite.

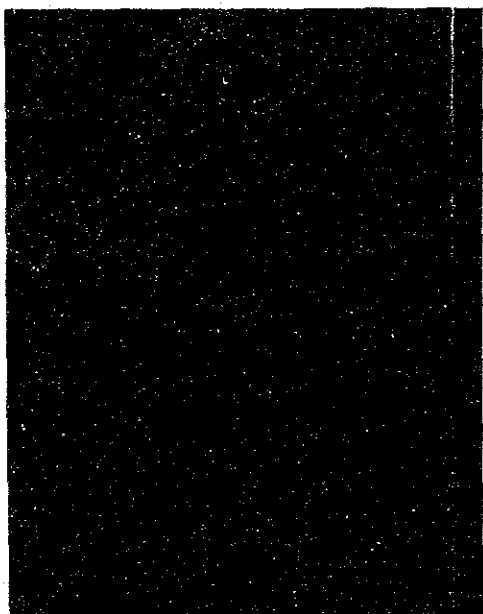
200 X



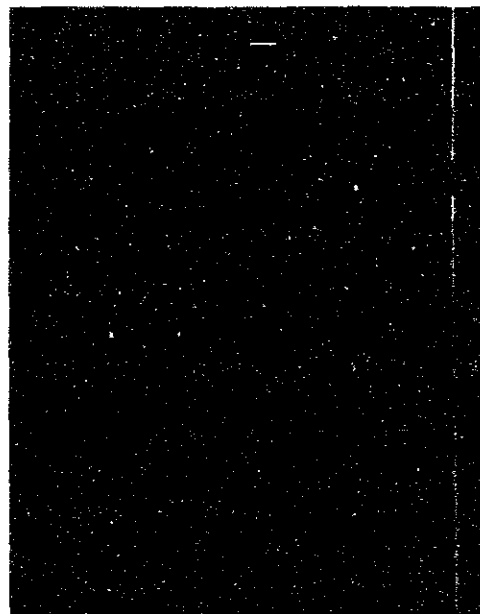
1000 X



300X
Ba-Lα



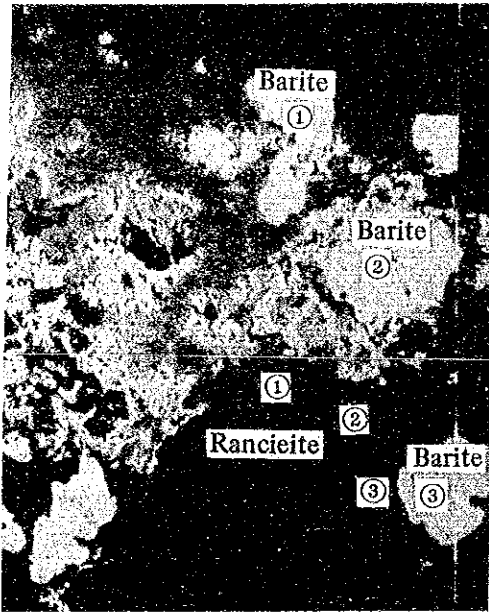
300X
La-Lα partly Ba-Lα



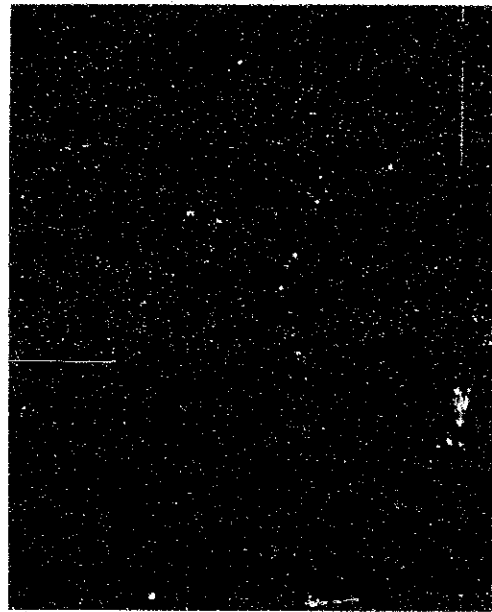
Sample No ; BR-12-B
Depth ; 50.30m
Rock type ; Ferro carbonatite
Mineral name ; Barite, Bastnaesite

Apx. 11 X-ray Images of Minerals (EPMA Test)

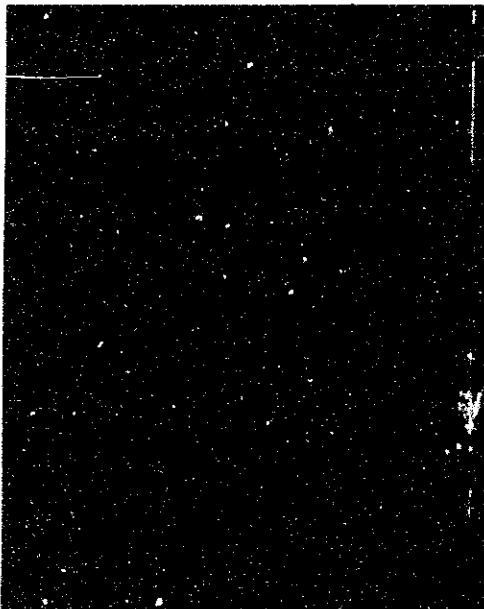
200 X



Mn-K α



Ba-L α



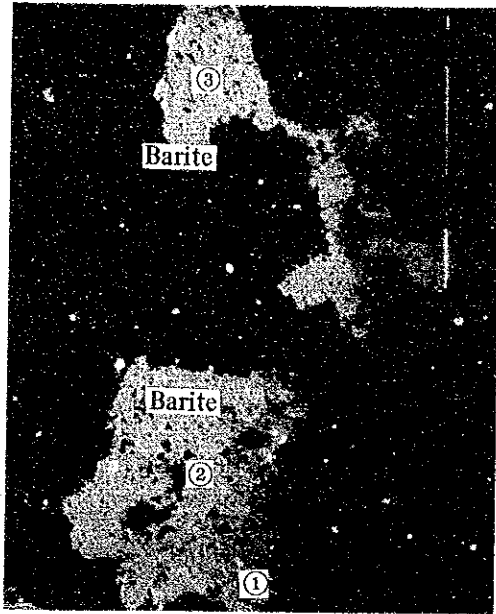
La-L α Partly Ba-L α



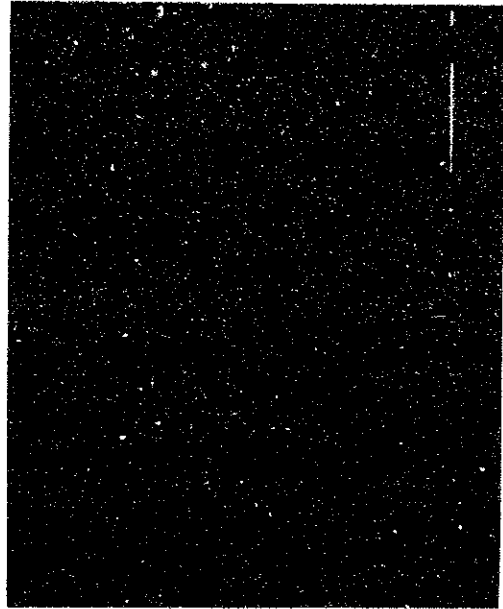
Sample No ; BR-14-A
Depth ; 9.30m
Rock type ; Carbonatite
Mineral name ; Rancieite, Barite

Apx. 11 X-ray Images of Minerals (EPMA Test)

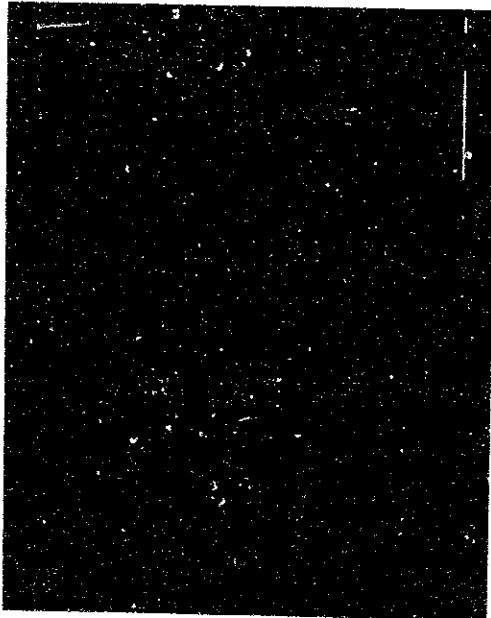
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S-K α



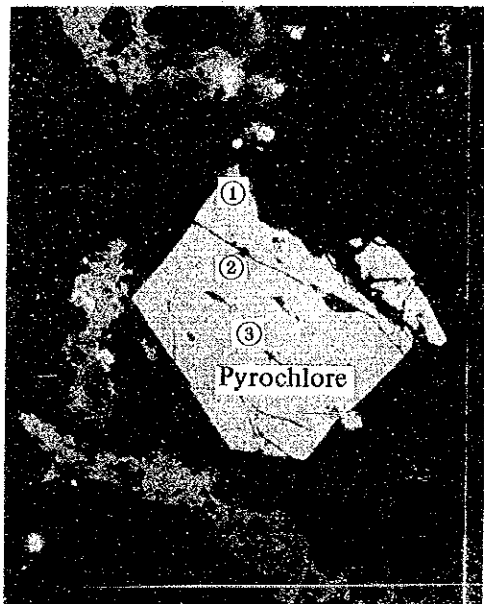
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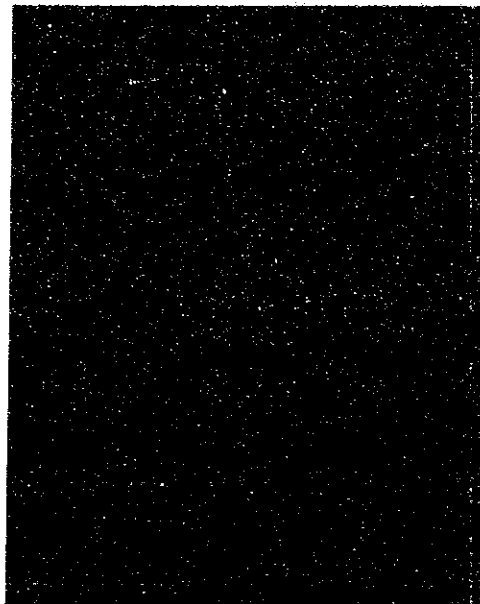
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Depth ; 107.30m
Rock type ; Carbonatite
Mineral name ; Barite

Apx. 11 X-ray Images of Minerals (EPMA Test)

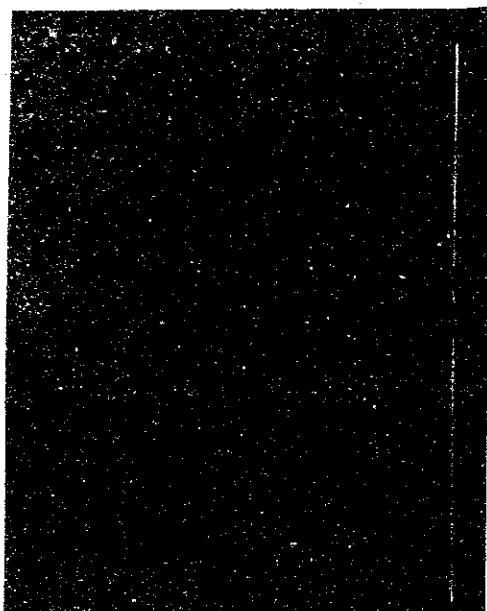
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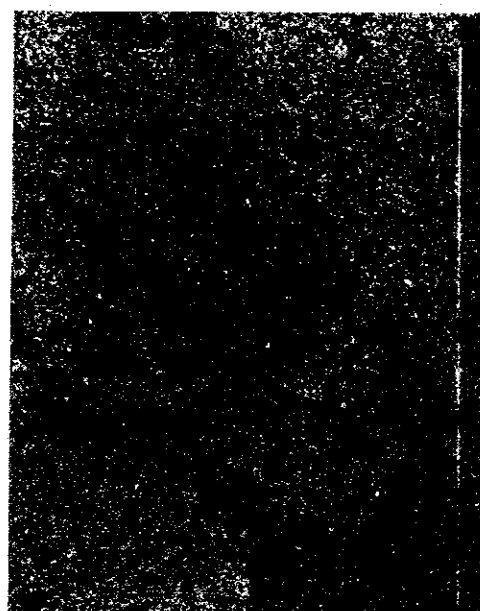
Nd-L α



P-K α



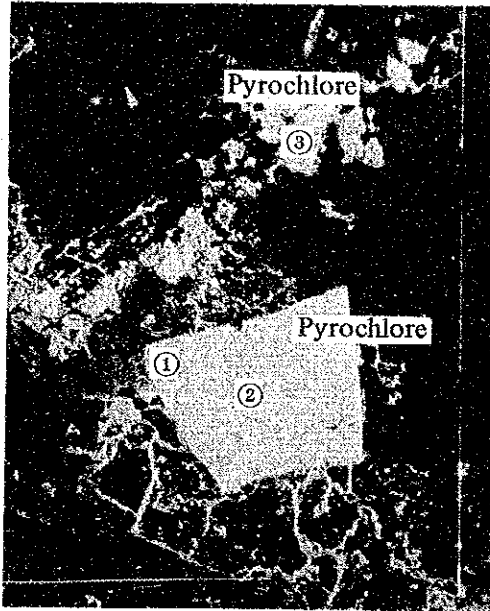
Ca-K α



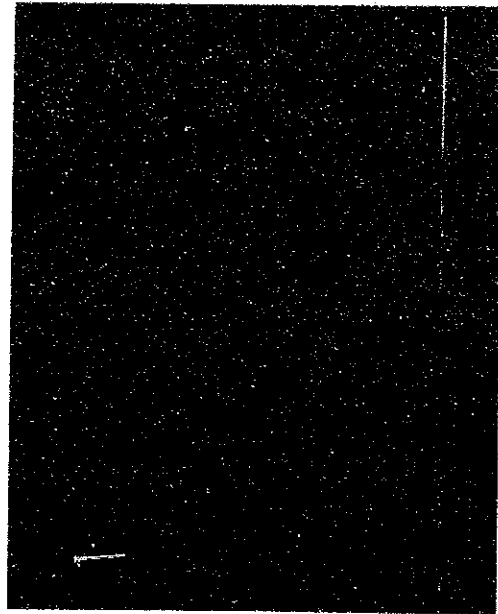
Sample No ; BRL-1-F
Depth ; 131.30m
Rock type ; Carbonatite
Mineral name ; Pyrochlore

Apx. 11 X-ray Images of Minerals (EPMA Test)

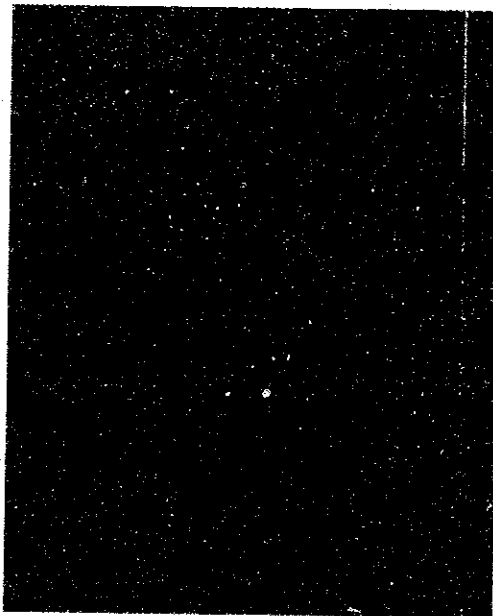
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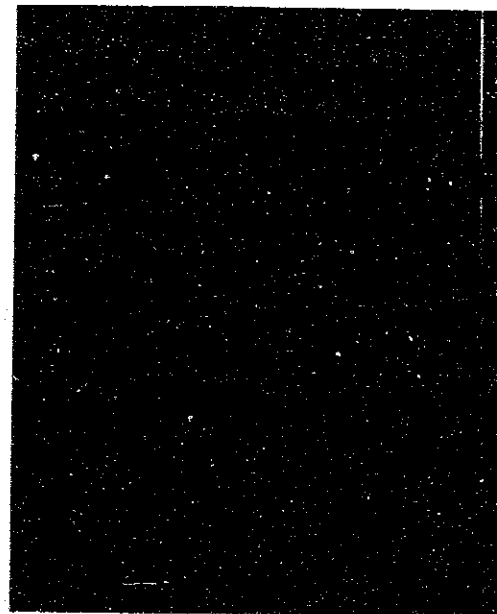
Nb-L α



Ca-K α



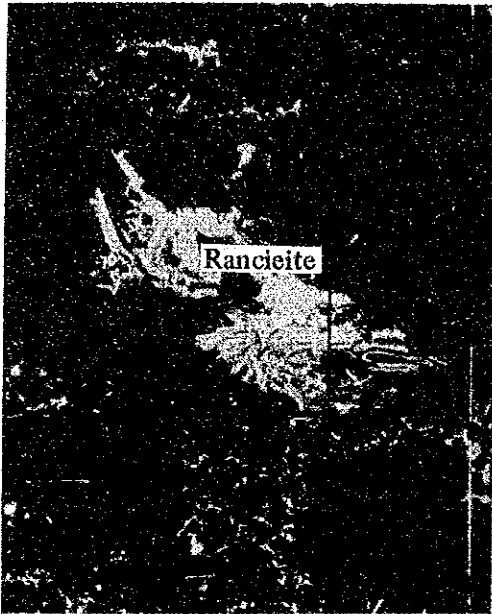
Na-K α



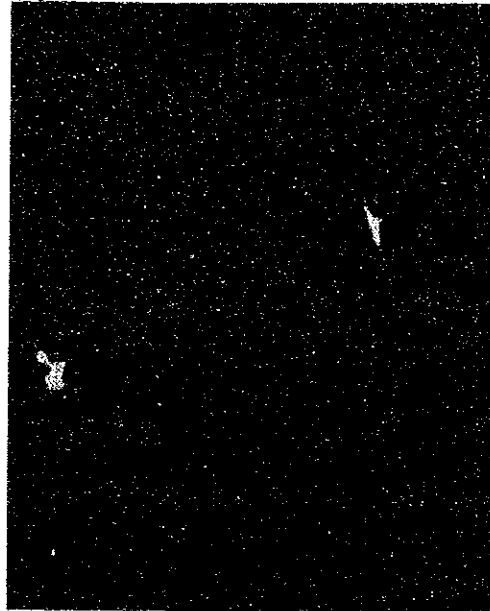
Sample No ; BR-9-A
Depth ; 29.20m
Rock type ; Carbonatite
Mineral name ; Pyrochlore

Apx. 11 X-ray Images of Minerals (EPMA Test)

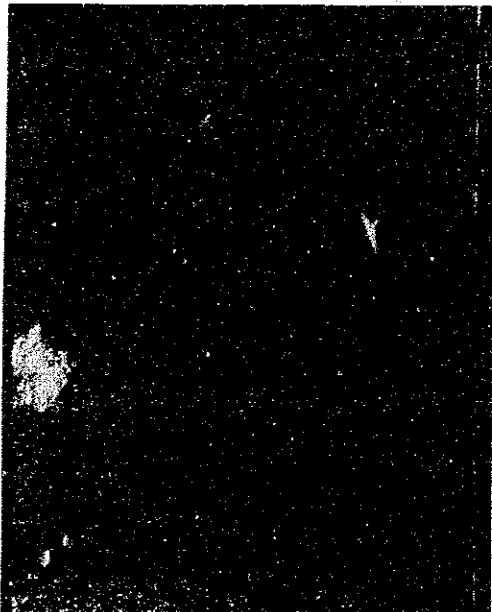
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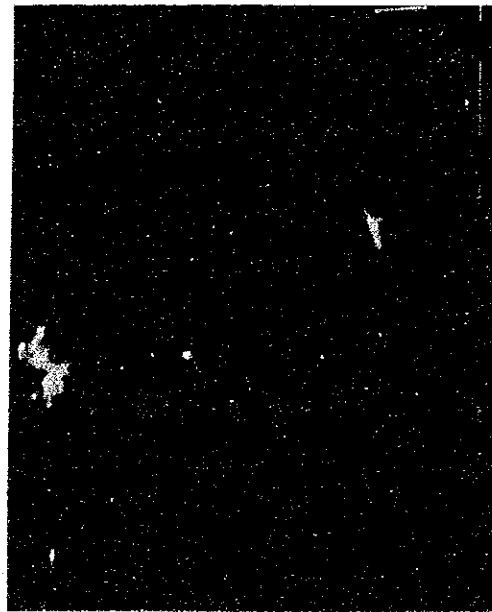
Mn-K α 2000X



Ca-K α 2000X



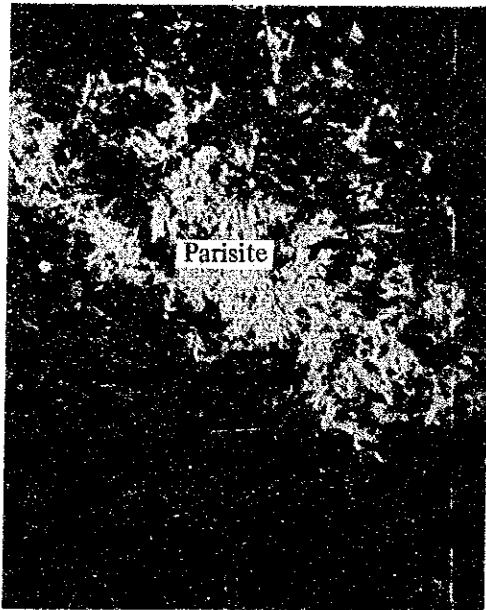
Ba-L α 2000X



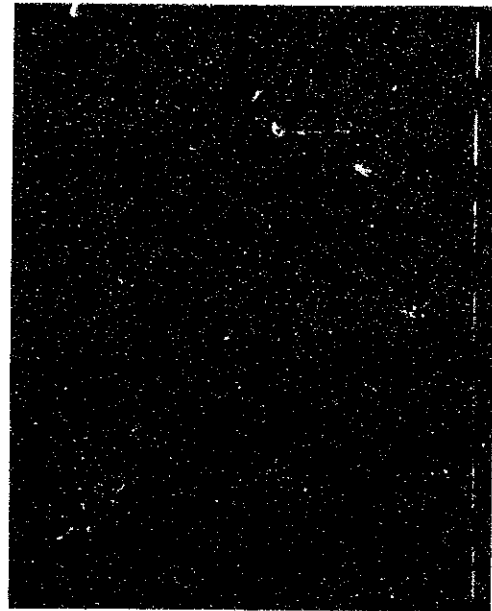
Sample No ; BR-1-A
Depth ; 9.50m
Rock type ; Ferrocarbonatite
Mineral name ; Ba-rich rancieite

Ap \times . 11 X-ray Images of Minerals (EPMA Test)

1000 X



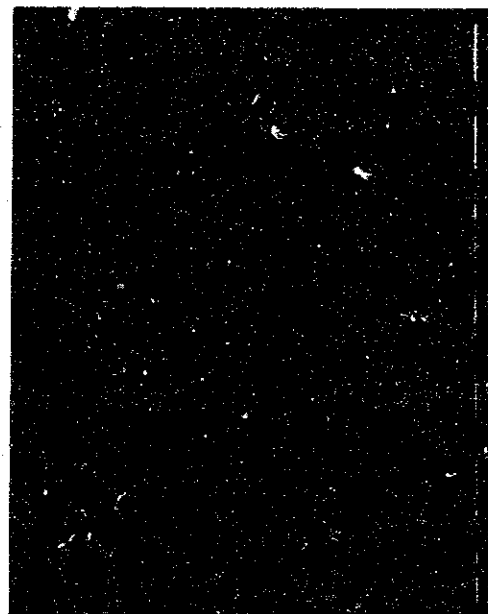
La-L α



Ce-L α



Ca-K α



Sample No ; BR-10-A

Depth ; 26.10m

Rock type ; carbonatite

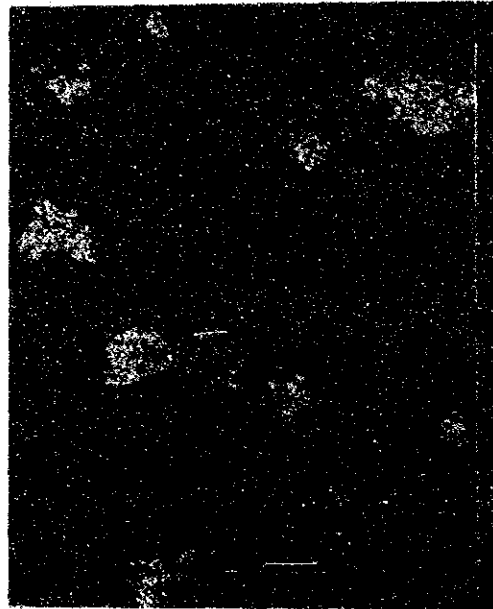
Mineral name ; Parisite

Apix. 11 X-ray Images of Minerals (EPMA Test)

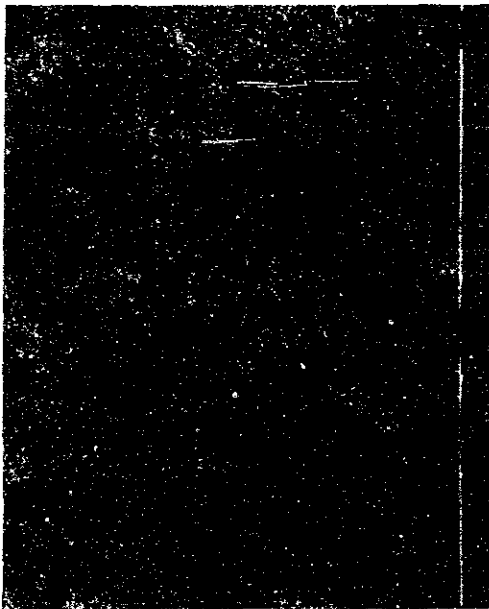
350 X



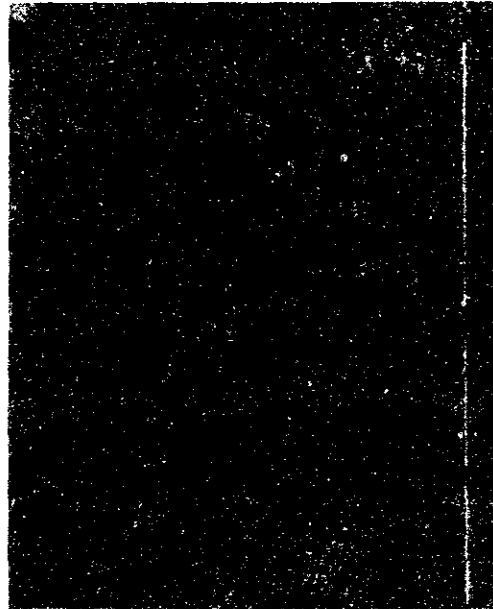
Sr-L α 400X



Ba-L α + Ce-L α + La-L α 400X



Ka-K α 400X



Sample No ; BRL-1-H

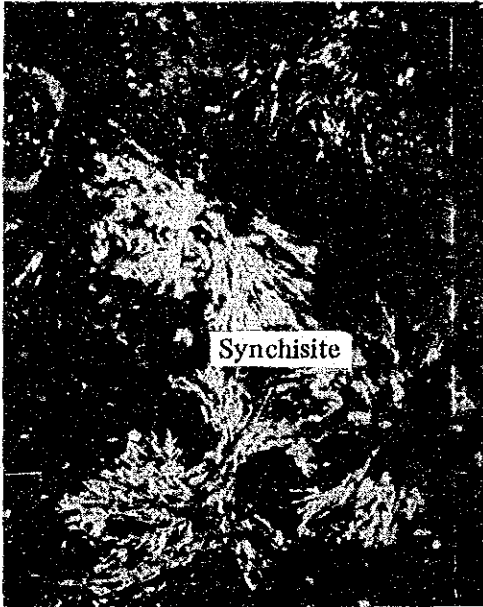
Depth ; 198.10m

Rock type ; Carbonatite

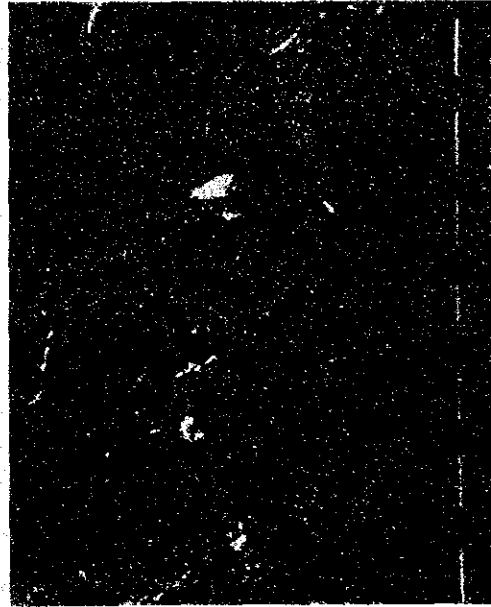
Mineral name ; Huanghoite-Synchysite (Hu-Sy)

Apx. 11 X-ray Images of Minerals (EPMA Test)

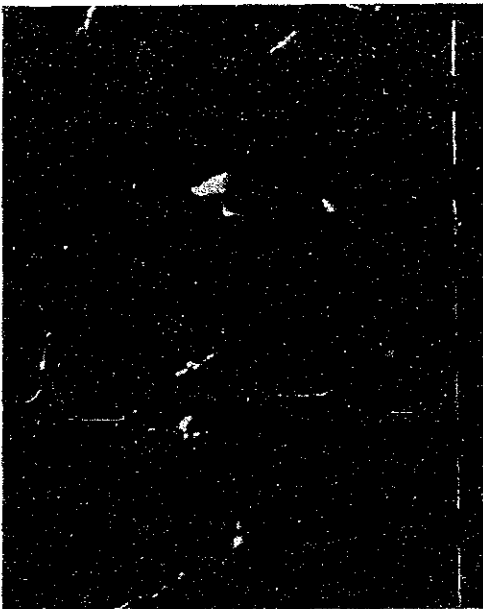
1000 X



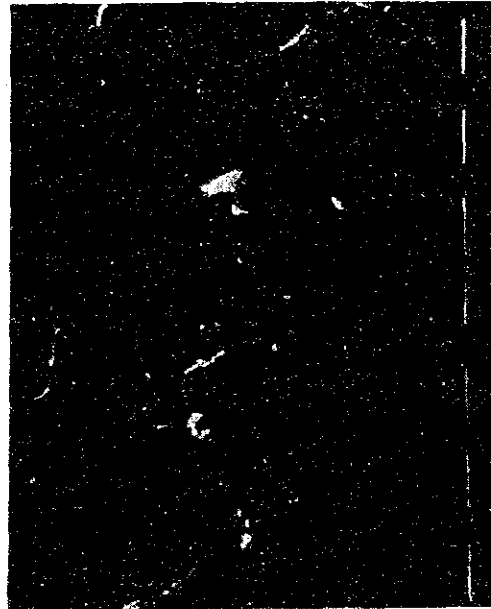
Ca-K α



Mn-K α



Ce-L α partly Ba-L β



Sample No ; BRL-1-A

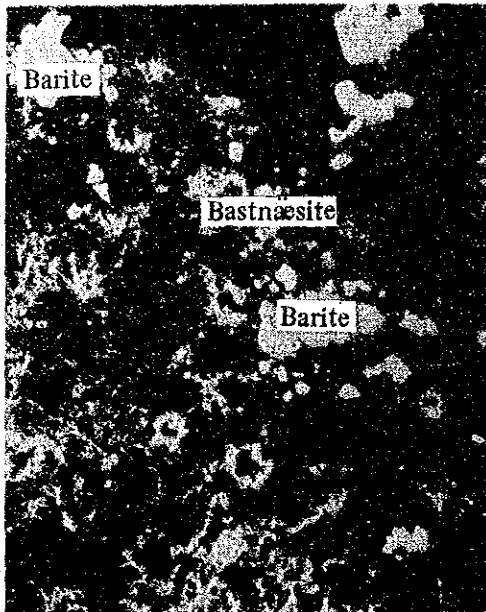
Depth ; 68.10m

Rock type ; Mn-Fe ore

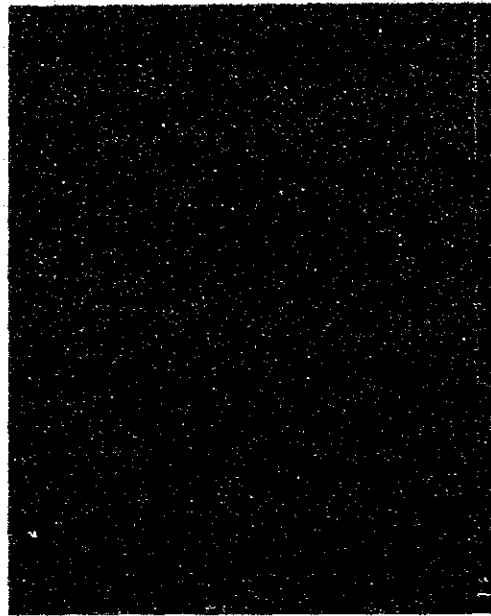
Mineral name ; Synchisite

Apx. 11 X-ray Images of Minerals (EPMA Test)

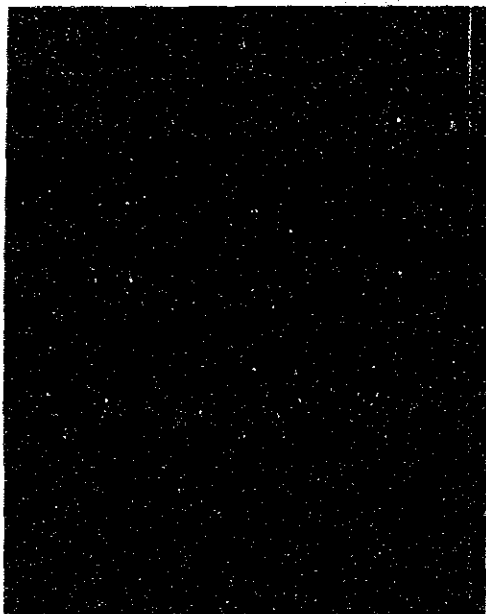
500 X



Ba-La 700X



S-K α 700X



La-La 700X



Sample No ; BR-1-E
Depth ; 38.20m
Rock type ; Carbonatite
Mineral name ; Barite, Bastnaesite

Apx. 11 X-ray Images of Minerals (EPMA Test)

Apx. 12 Results of Geochemical Analysis

SAMPLE NUMBER	COORDI- NATES (m)	ROCK TYPE	ppm														P %	BaY (XRF) ppm		Nb-XRF ppm		
			Ce	NAA	Eu	NAA	La	NAA	Lu	NAA	Nd	NAA	Sm	NAA	Tb	NAA		Th	NAA	U	NAA	Yb
KA-04	50	200	ALV	1660	29.0	782	0.9	584	96.1	7.5	55	<1	5.3	0.066	767	1480	120	1050				
KA-05	50	250	ALV	1425	23.0	656	1.0	496	81.9	5.1	55	<1	6.1	0.083	776	4010	125	810				
KA-06	50	300	ALV	2340	37.5	1220	1.7	792	131.0	11.2	95	1	10.7	0.322	1390	6670	190	4050				
KA-07	50	350	ALV	1535	29.9	708	1.5	571	99.5	6.7	74	<1	8.2	0.253	1475	4970	160	1500				
KA-08	50	400	FCB	2250	36.4	1260	3.9	999	138.0	12.7	1245	5	25.7	0.598	2910	13280	470	375				
KB-02	100	100	ALV	1370	25.3	655	1.1	515	84.1	5.5	60	2	9.6	0.047	1160	4740	185	465				
KB-03	100	150	ALV	3170	34.7	2380	1.4	715	99.3	6.1	134	4	9.1	0.046	1390	4930	220	762				
KB-04	100	200	ALV	5660	36.3	4000	1.8	1380	161.5	13.4	88	2	6.6	0.348	1470	5600	210	105				
KB-05	100	250	ALV	1940	33.8	947	0.8	684	116.0	7.9	48	<1	4.1	0.096	2900	6490	130	1130				
KB-06	100	300	ALV	2810	41.3	1535	1.9	829	155.5	11.5	77	<1	11.0	1.430	4150	7990	240	1200				
KB-07	100	350	ALV	651	13.8	420	1.0	224	44.5	3.1	75	5	6.4	0.508	1325	2720	120	320				
KB-08	100	400	ALV	1465	27.3	704	1.0	510	94.8	6.8	134	<1	7.2	0.369	1705	5800	160	250				
KB-09	100	450	FCB	7830	63.2	6850	4.4	1650	185.0	17.7	1716	80	25.0	1.060	2910	11150	670	370				
KB-10	100	500	FCB	7860	36.7	4390	1.7	1560	145.5	6.8	779	<5	9.4	0.182	1155	6940	210	700				
KB-11	100	550	ALV	8070	31.8	7230	2.2	1110	110.0	7.8	341	18	13.1	0.157	1280	8230	220	70				
KC-02	150	100	FCB	6150	48.9	3250	2.7	2270	172.0	7.7	607	<1	13.1	0.089	793	7890	300	600				
KC-03	150	150	ALV	1905	30.1	1155	1.5	678	93.9	8.1	81	3	7.4	0.122	2120	6790	180	2300				
KC-04	150	200	ALV	2610	38.9	1320	1.2	968	120.0	7.4	123	<1	7.9	0.045	1380	5830	230	1050				
KC-05	150	250	ALV	2240	32.6	1115	0.5	899	129.0	5.9	32	2	4.7	0.861	2950	5800	140	3450				
KC-06	150	300	ALV	2720	43.6	1360	1.4	1050	160.0	9.1	37	<1	7.0	0.833	3450	5960	210	2050				
KC-07	150	350	ALV	3180	45.1	1690	1.3	1250	176.0	10.2	81	<1	10.9	0.134	2670	5290	240	1650				
KC-08	150	400	ALV	1830	41.4	896	0.9	801	132.0	8.7	166	3	6.2	0.279	2220	3950	200	610				
KC-09	150	450	ALV	3330	16.7	2800	3.0	567	59.3	5.8	265	3	12.1	0.066	834	8440	260	570				
KC-10	150	500	ALV	4680	39.8	3850	5.6	813	88.2	15.3	181	<1	23.2	0.103	1085	10690	650	200				
KD-02	200	100	FCB	6460	45.6	3240	1.8	2100	183.5	7.2	640	<1	9.0	0.068	704	24000	190	550				
KD-03	200	150	ALV	2310	40.2	1375	2.4	893	136.0	12.0	67	4	14.5	0.136	935	4420	360	750				
KD-04	200	200	ALV	1080	16.4	542	0.5	427	57.3	3.6	70	<1	2.6	0.047	3770	4260	81	72				
KD-05	200	250	ALV	3360	41.0	2020	2.5	1180	152.0	12.9	64	6	11.3	0.056	713	6880	260	780				
KD-06	200	300	ALV	3990	46.7	1950	0.3	1630	205	11.8	76	<1	5.4	0.061	716	7530	160	70				
KD-07	200	350	ALV	1390	24.0	662	0.5	441	83.4	5.4	39	2	4.1	0.085	3750	3750	115	810				
KD-08	200	400	ALV	1175	19.7	544	0.6	353	67.9	5.4	34	<1	3.4	0.052	1325	2110	87	1450				
KD-09	200	450	ALV	872	15.6	398	1.2	215	52.9	4.2	67	16	5.5	5.64	6790	6340	100	1450				
KD-10	200	500	ALV	1145	22.2	491	0.7	331	77.0	7.6	29	<1	3.8	0.080	2610	1250	115	740				
KE-01	250	50	FCB	3490	44.0	1140	1.5	1445	187.0	7.9	1741	1	6.0	0.353	1160	14990	160	1050				
KE-02	250	100	FCB	7590	37.0	5260	1.9	1195	137.0	7.5	328	<7	8.8	0.077	929	8800	180	1000				
KE-03	250	150	ALV	1600	29.0	738	1.5	523	102.5	6.6	232	<1	7.3	0.139	1510	4030	150	215				
KE-04	250	200	ALV	991	15.5	528	0.5	227	48.6	3.2	36	<1	2.4	0.040	3660	2830	65	110				
KE-05	250	250	ALV	2760	39.5	1210	0.6	744	136.5	9.7	77	5	3.8	0.070	1760	3000	145	245				
KE-06	250	300	ALV	3450	51.2	1870	0.7	907	173.0	10.0	67	<2	3.7	0.039	483	4500	130	300				
KE-07	250	350	ALV	2120	28.7	1240	1.1	549	105.0	7.4	49	6	6.2	0.037	2090	1860	170	1100				