LES MINÉRALISATIONS AURIFÈRES DU GISEMENT DE BEATTIE À DUPARQUET, QUÉBEC, CANADA

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CONSOREM - DIVEX

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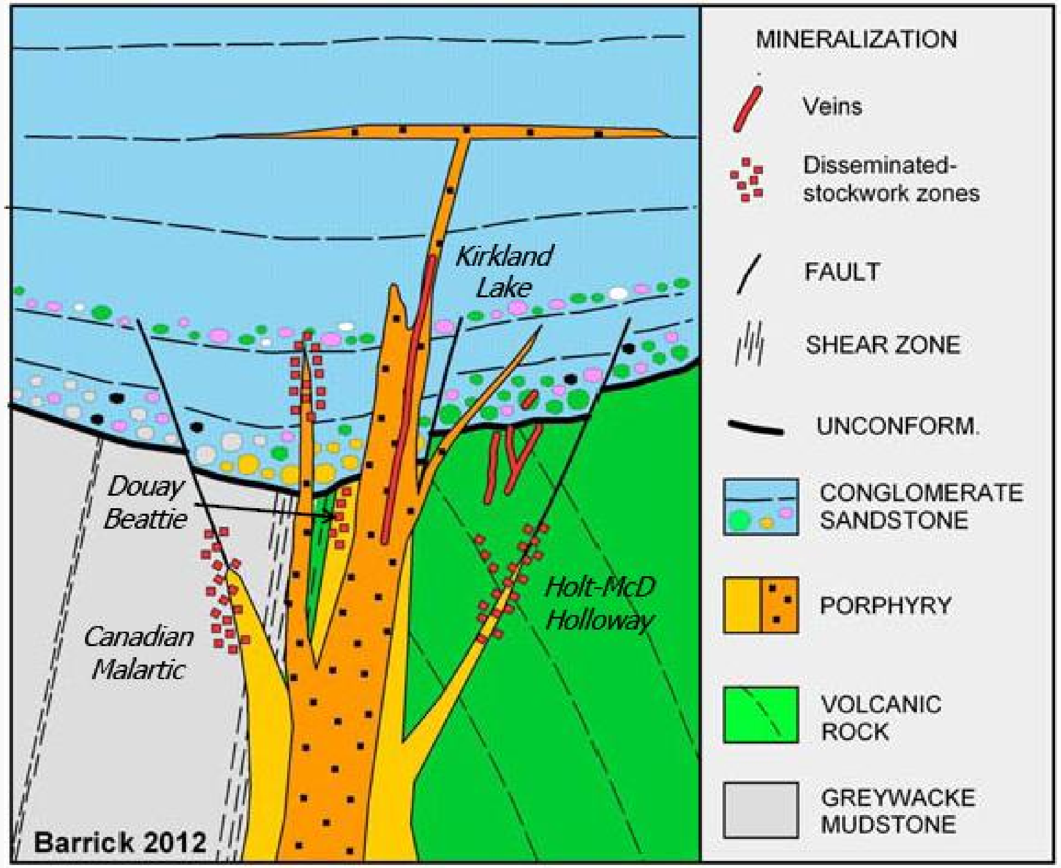
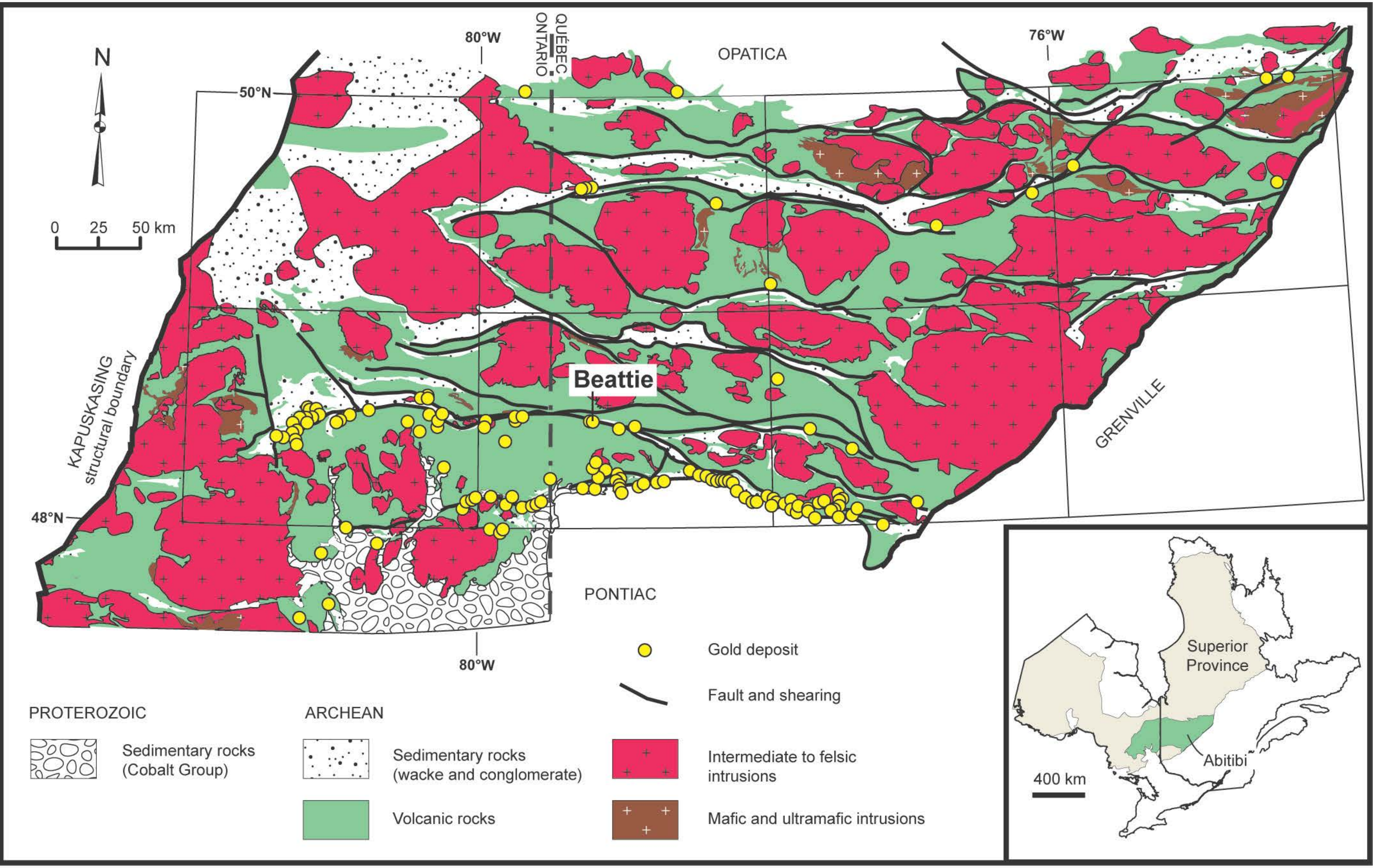
Syénite Aurifère

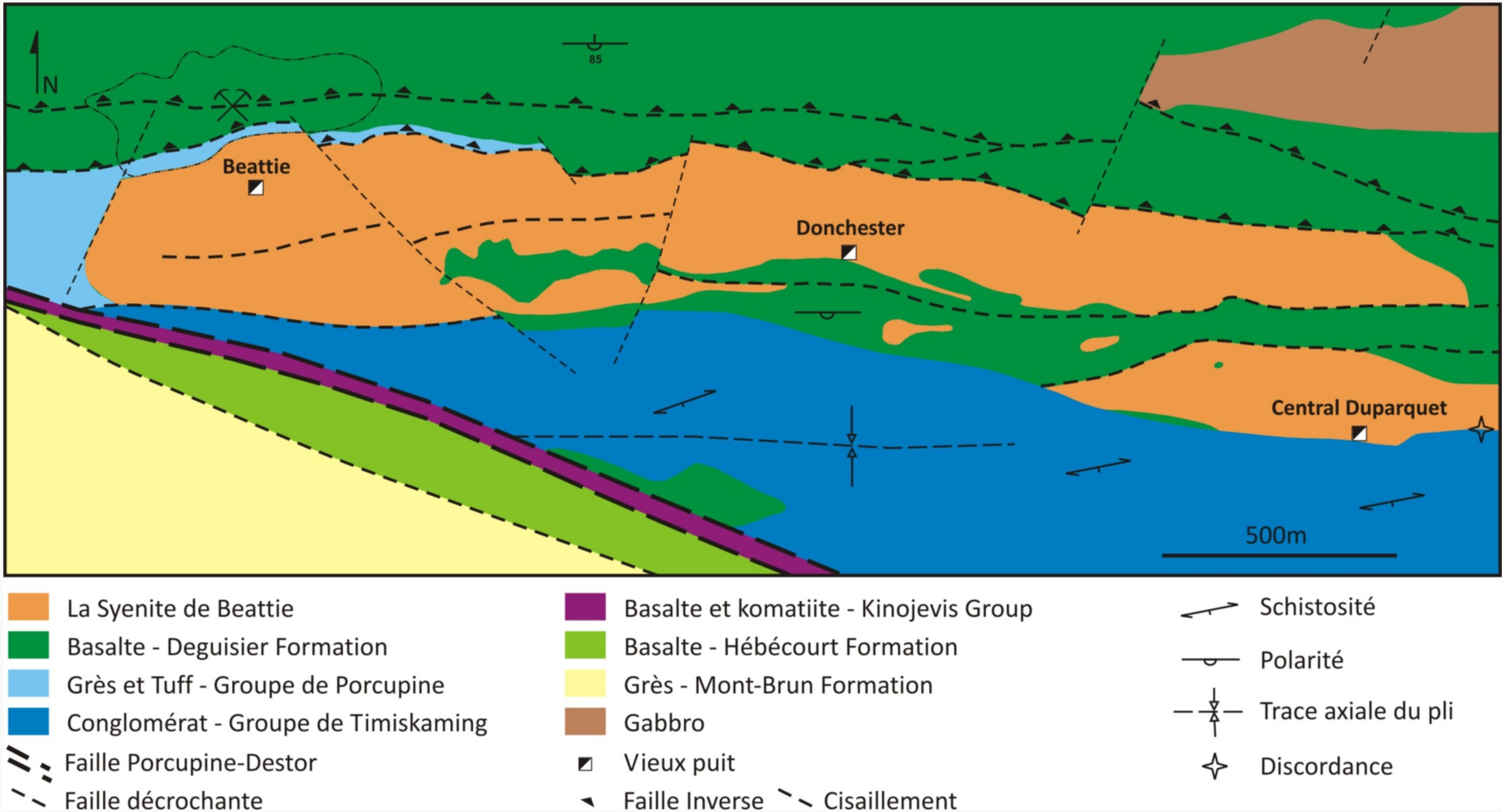


D'après Robert, 2001

- Syénite de Beattie: 2681,6±1Ma (Mueller et al. 1996)
- 1 Moz d'or extrait de 9,26Mt @ 3.86g/t (1931-1956; Bevan, 2009)
- 3,11 Moz M+I dans 60Mt @ 1,59g/t, et 1,44Moz Inf dans 29,7Mt @ 1,51g/t (Williamson et al., 2013)



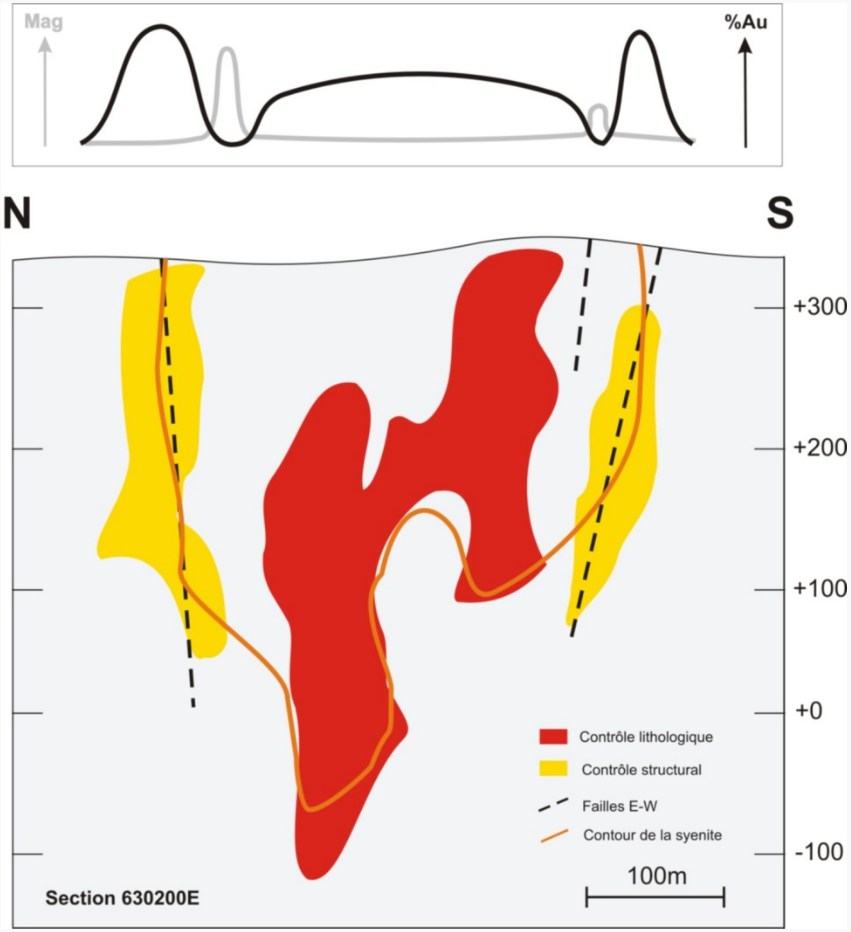
Modifé de Doucet et al. 2000

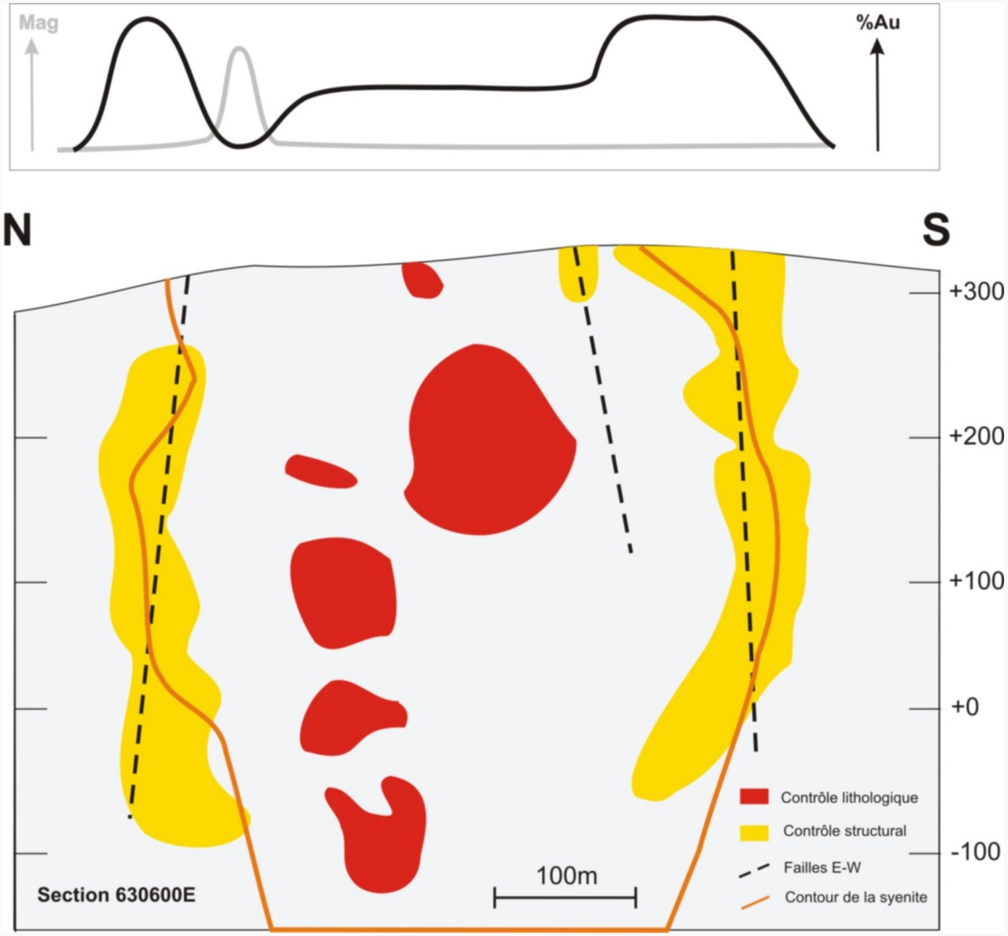


Modifié de Bourdeau et al., 2011 (en préparation)

Deux styles de minéralisation aurifère

Contrôle Lithologique vs Contrôle Structural

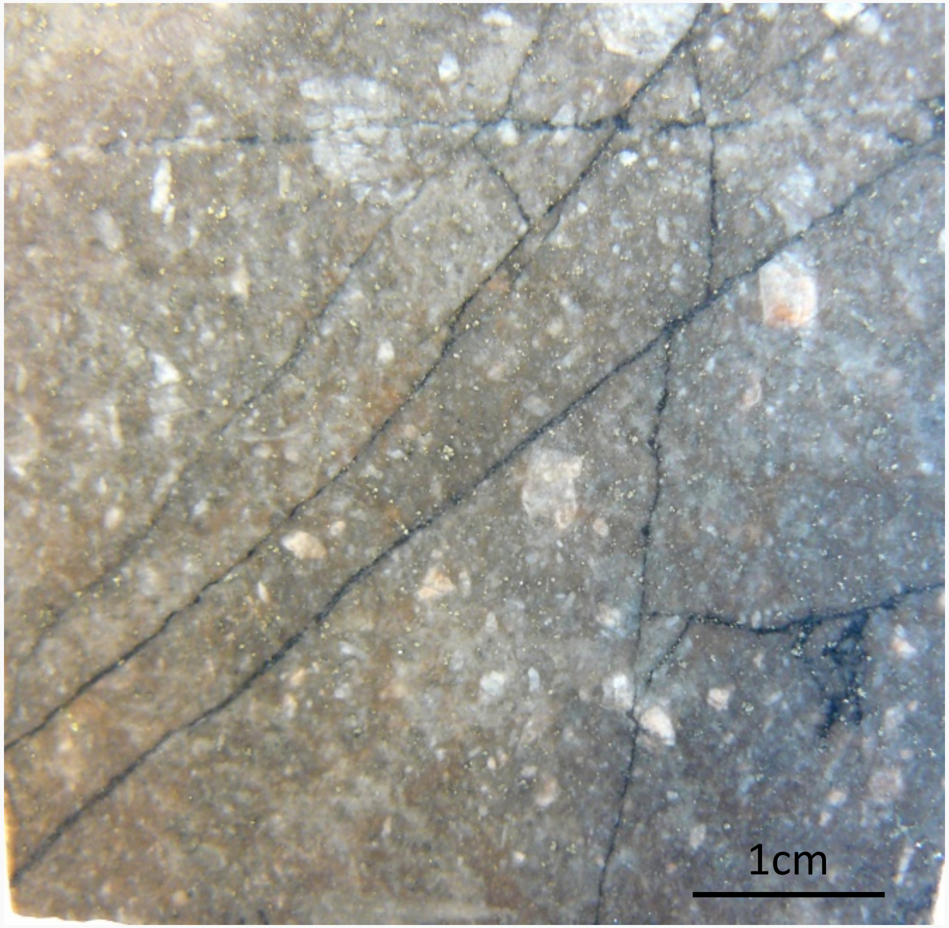


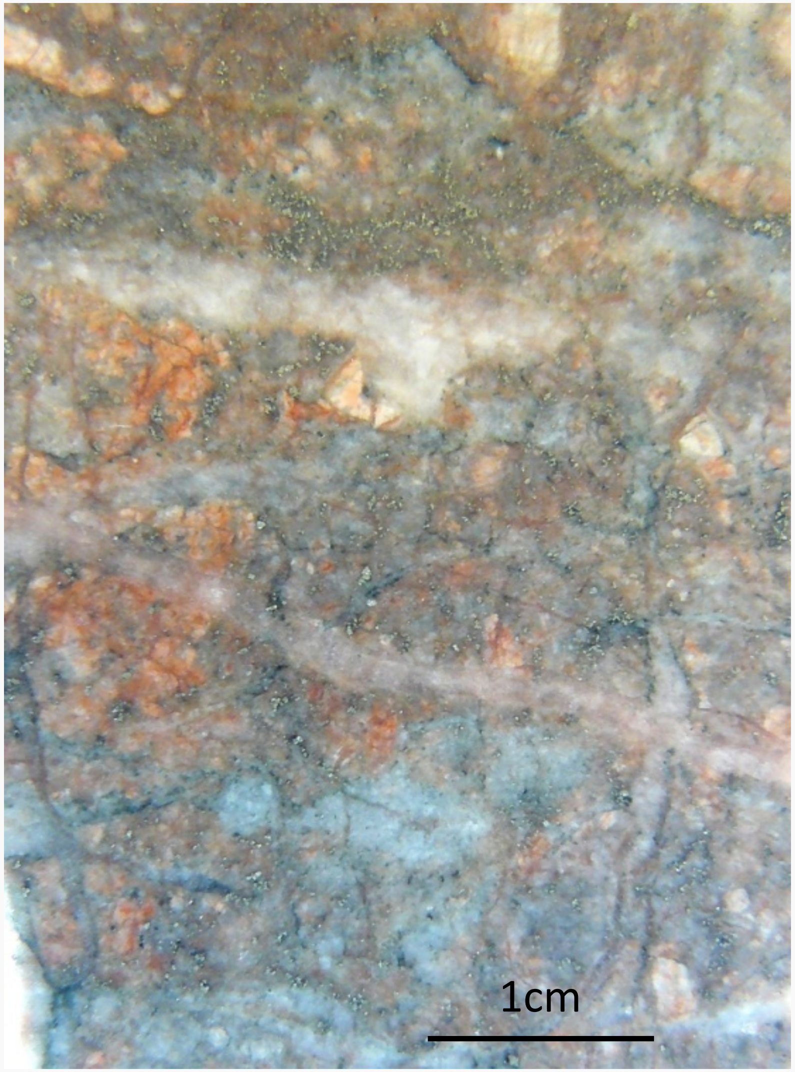


Contrôle lithologique de la minéralisation

Sulfures aurifères fins et disséminés, texture porphyrique et en stockwork, assemblage à pyrite-arsénopyrite (±galène et sphalérite)

Carbonatation pervasive ou en veinules

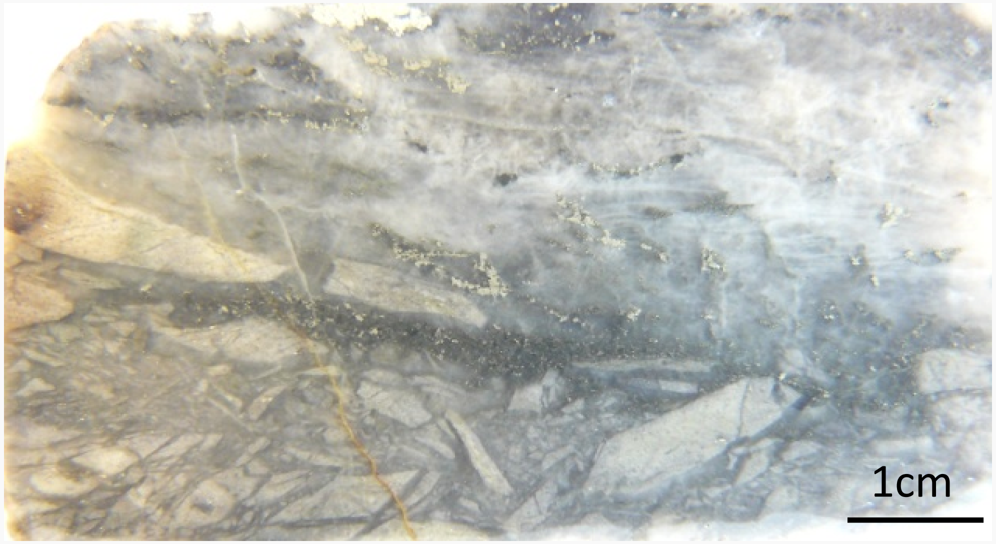




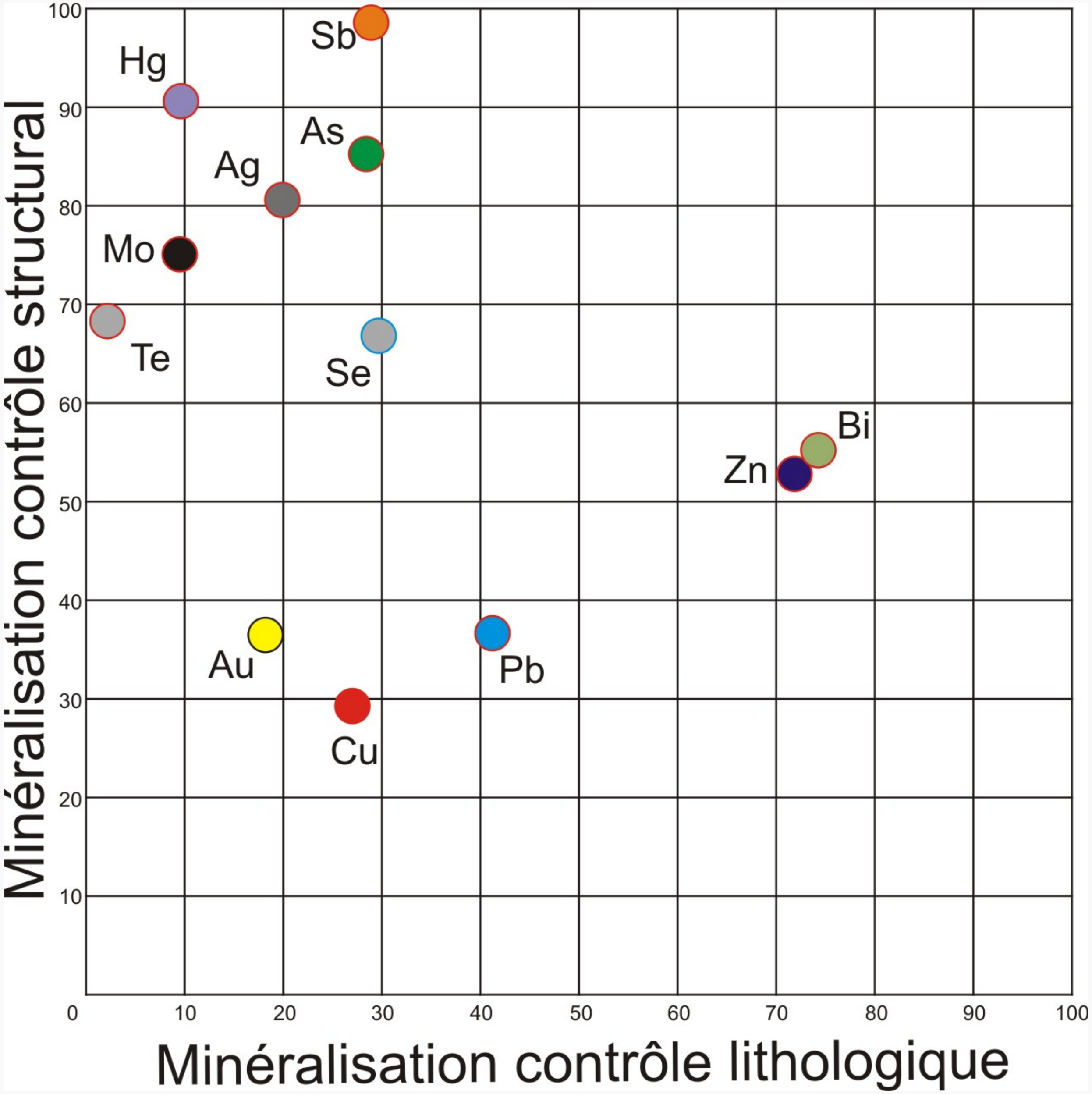
Contrôle structural dans les zones de failles E-W

Contrôle structural de la minéralisation

Brèche, veines, replacement, dike trachytique; Sulfures disséminés et en amas



Contrôle structural = faciès polymétallique



Évolution minérale : 4 phases

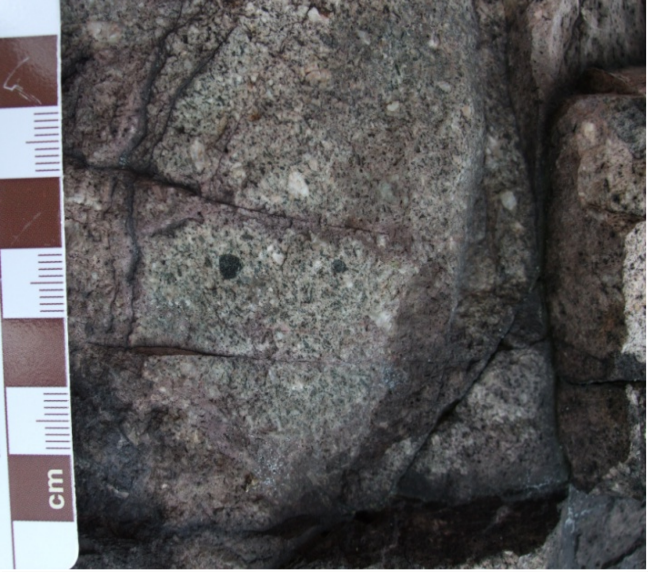
1 – Assemblage Fe-Ti

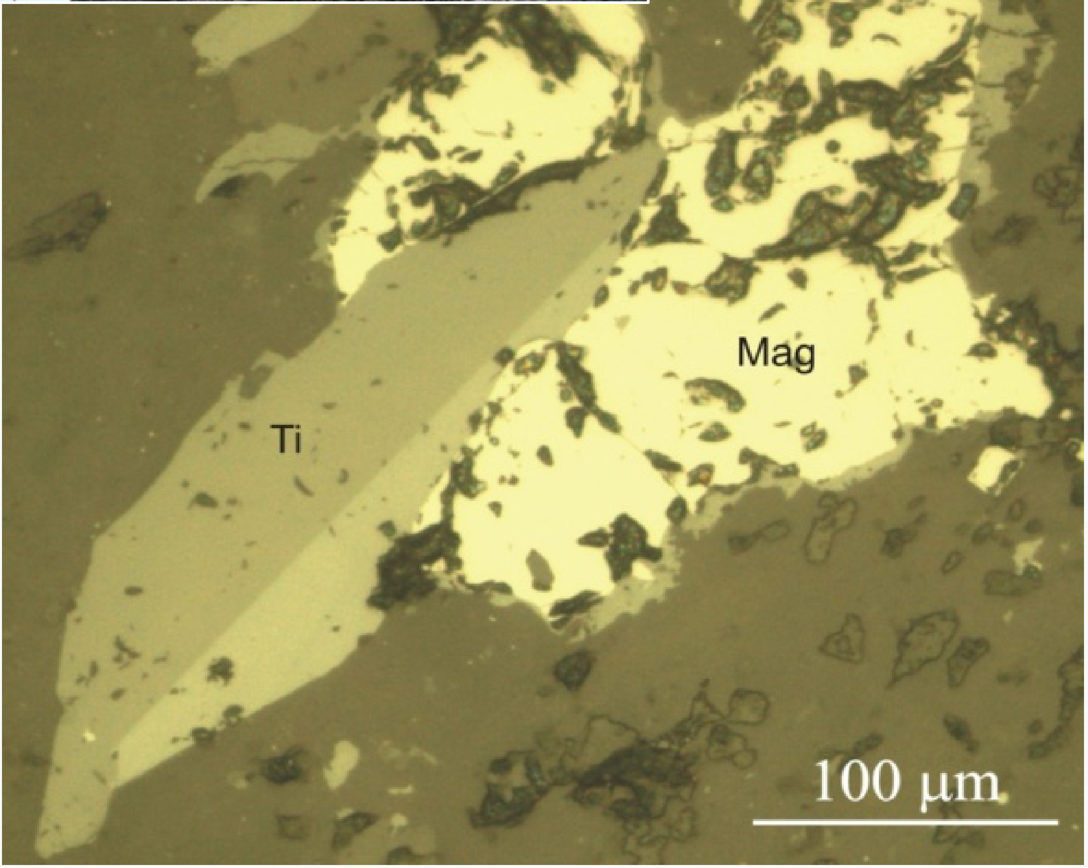
2 - Martitisation

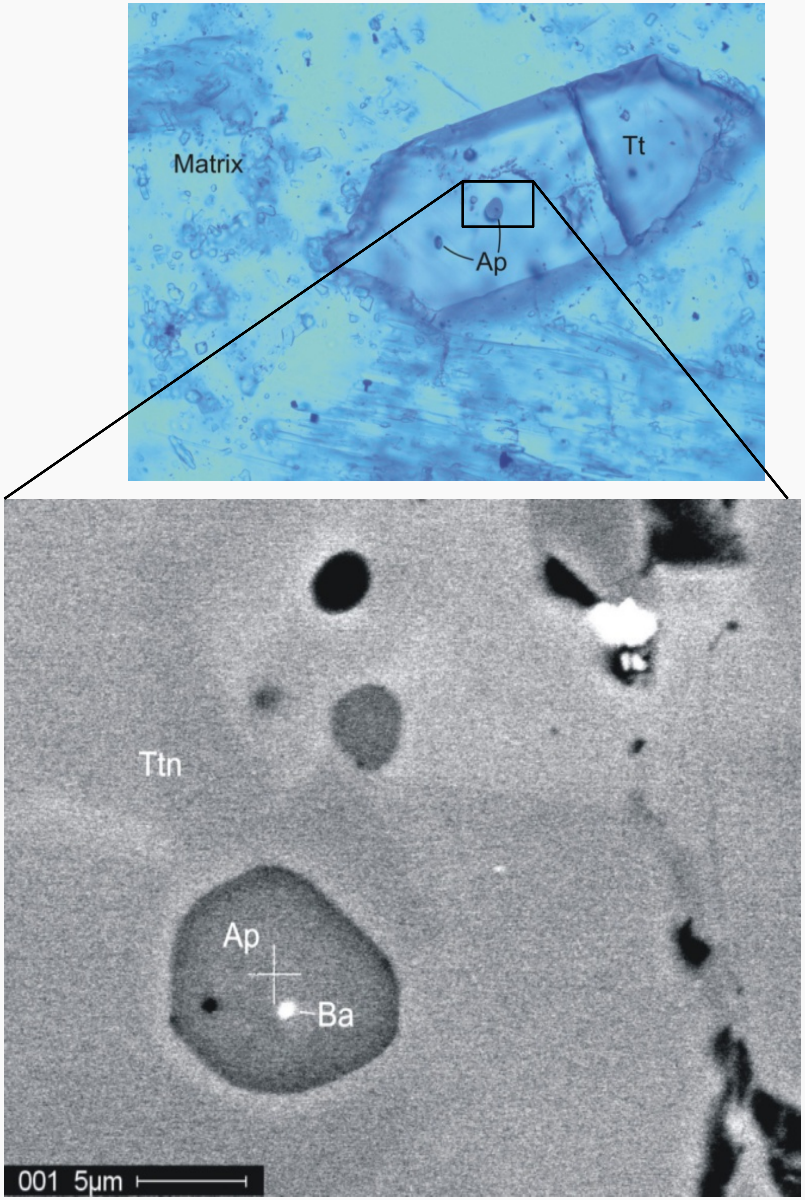
3 - Sulfuration

4 - Bréchification

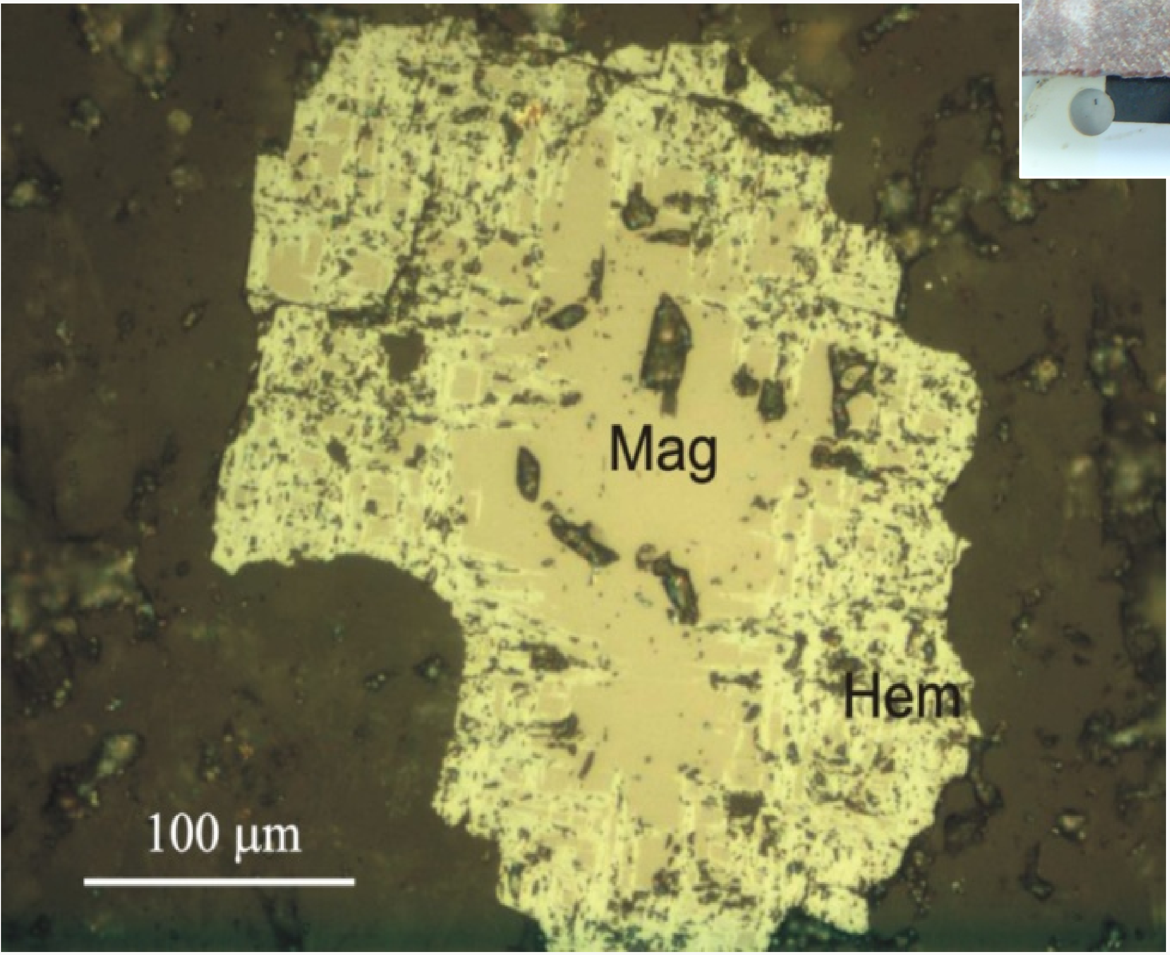
Fe-Ti assemblage: magnétite, titanite, apatite, barytine

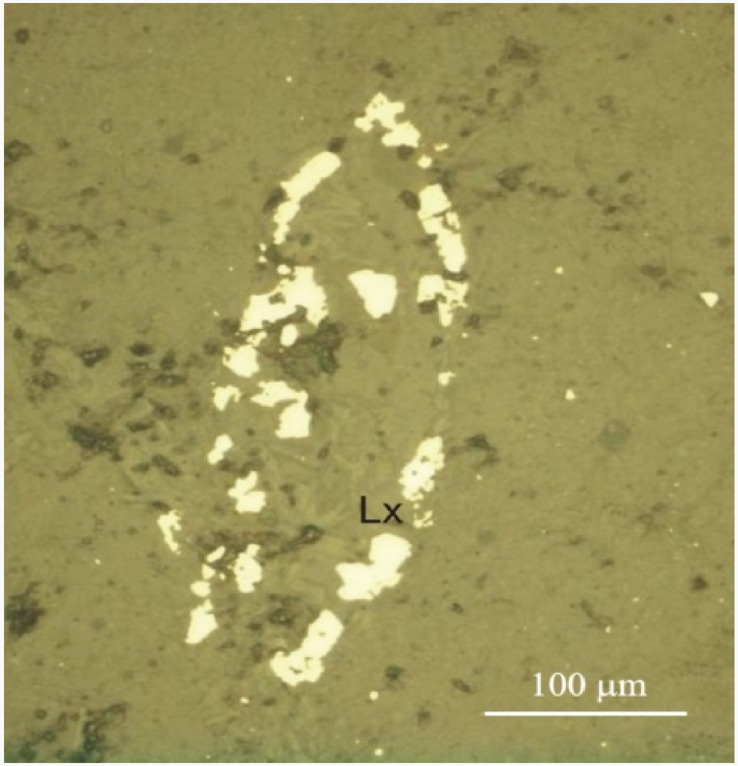




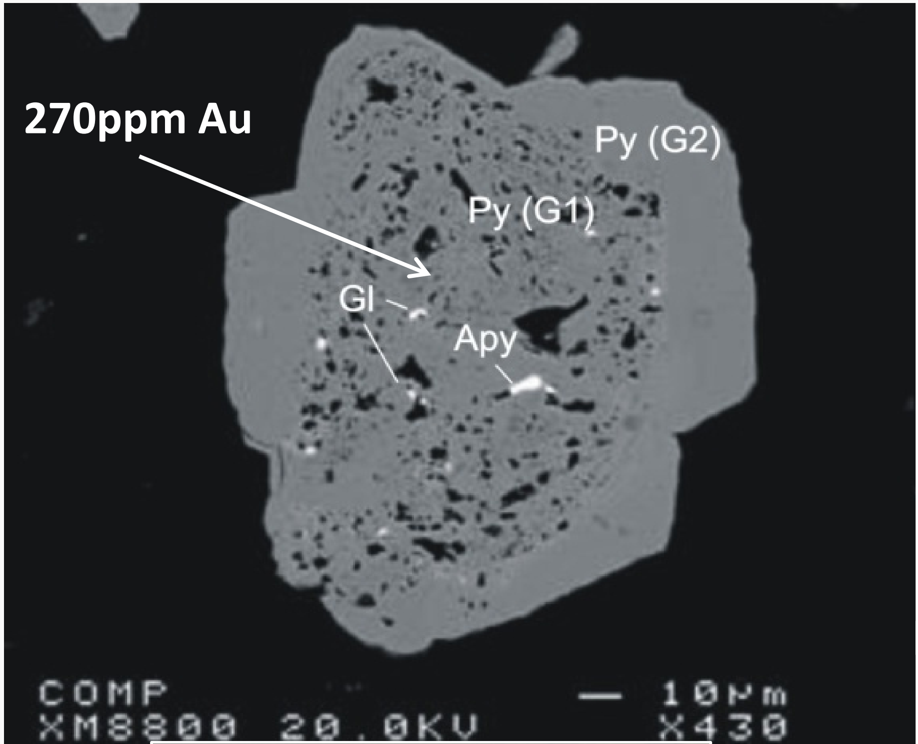


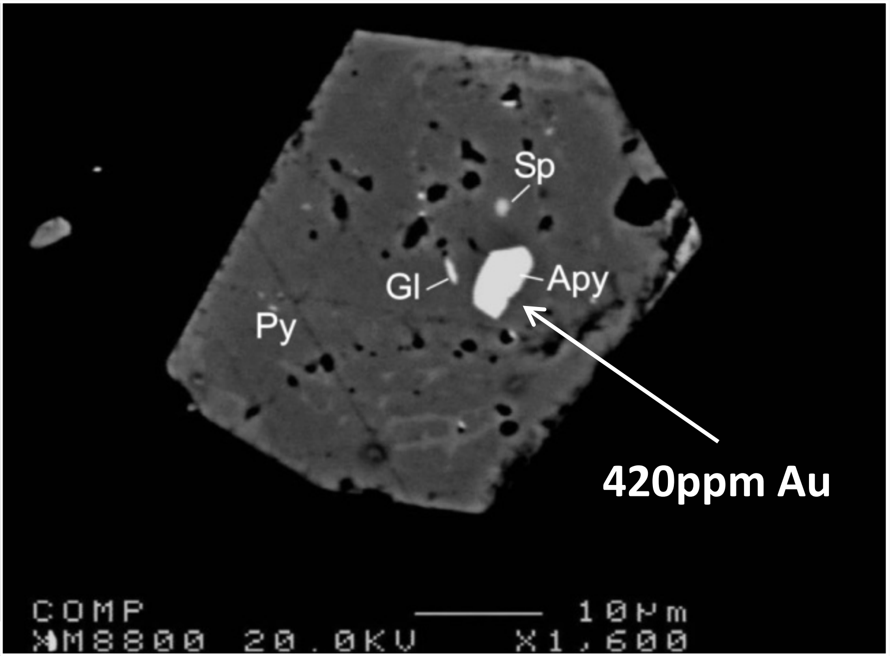
Martitisation : hématisation de la magnétite, abondance de leucoxènes

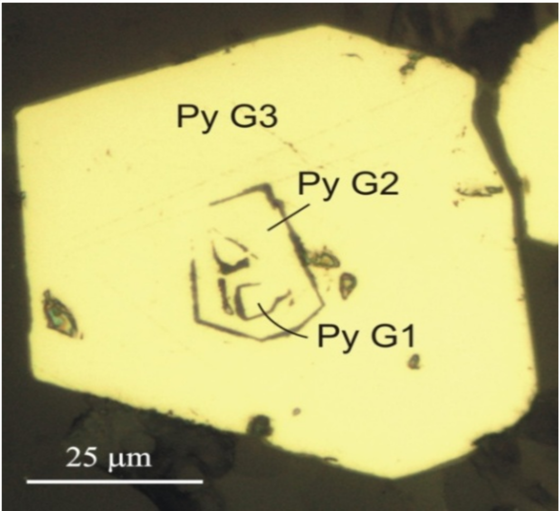


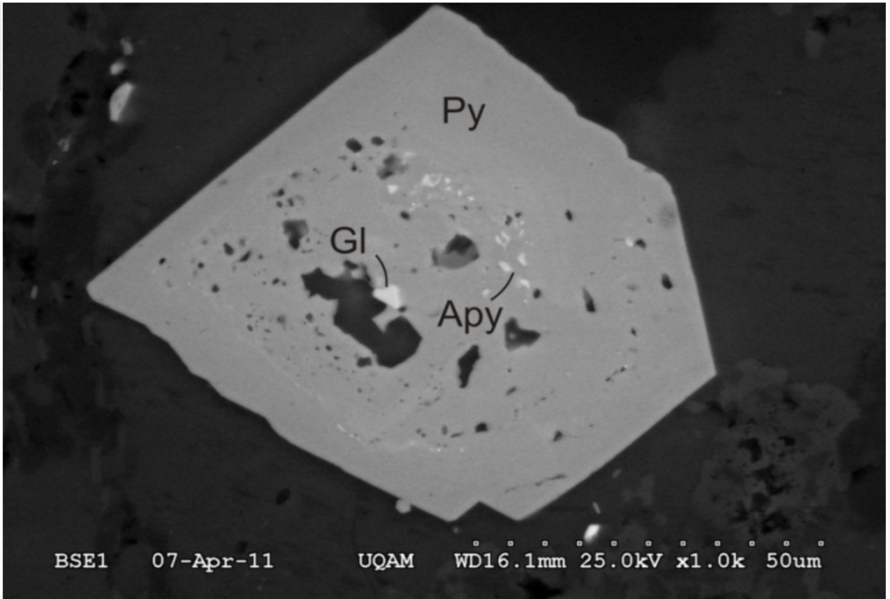


Sulfuration : Or invisible dans pyrite arsénifère et arsénopyrite



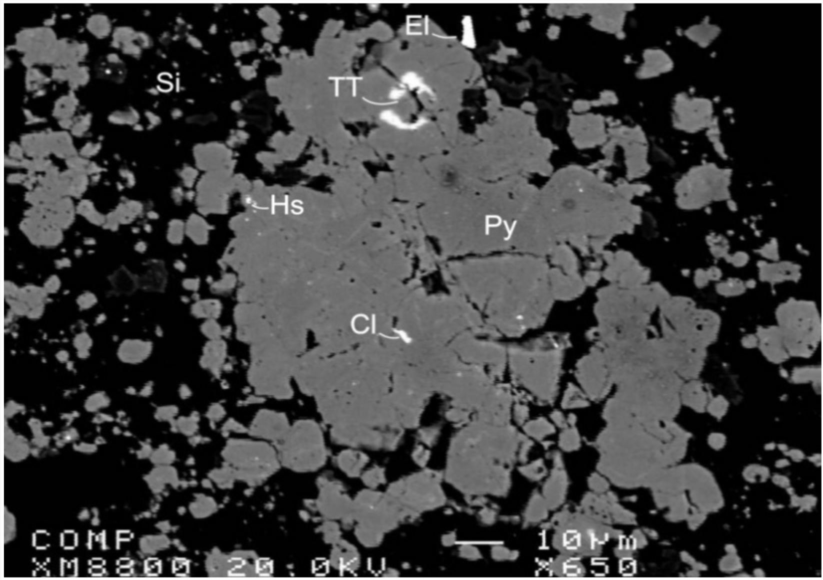


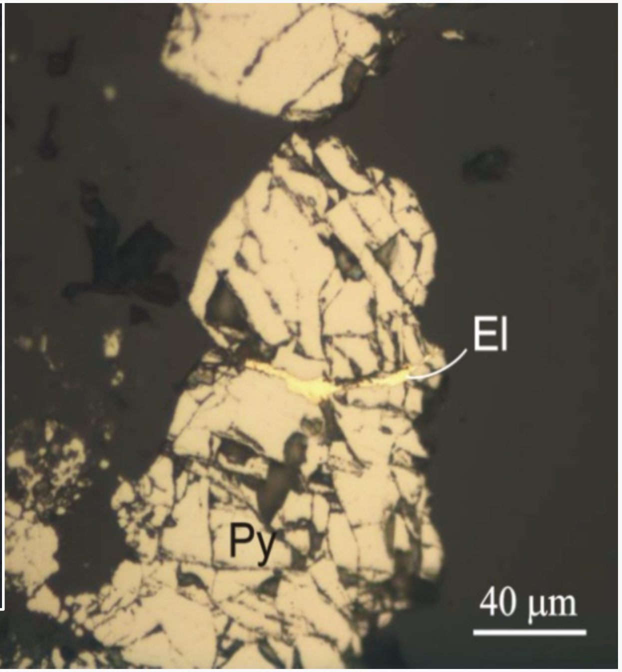


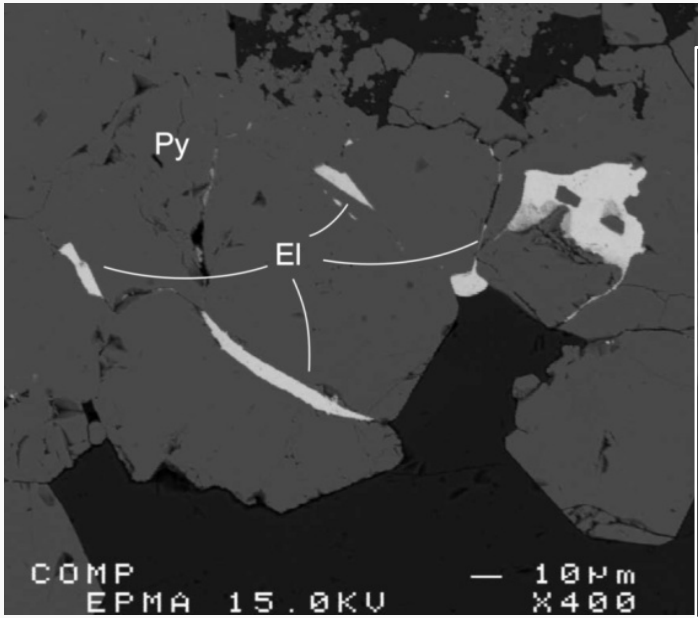


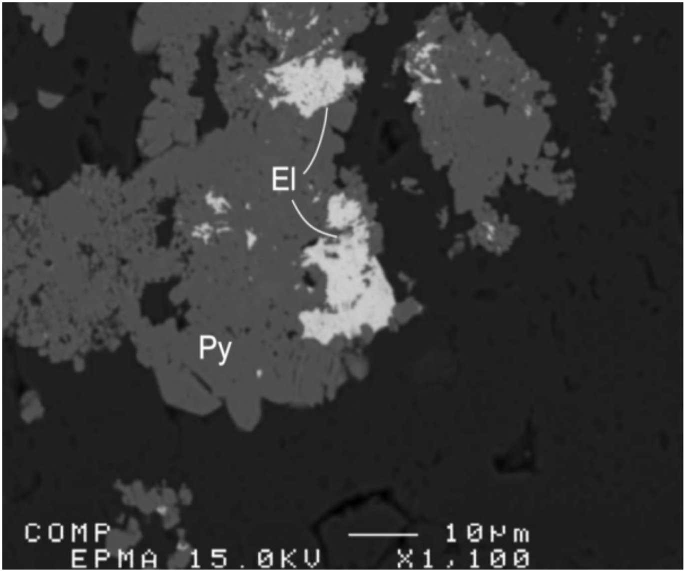
Or Invisible = solution solide

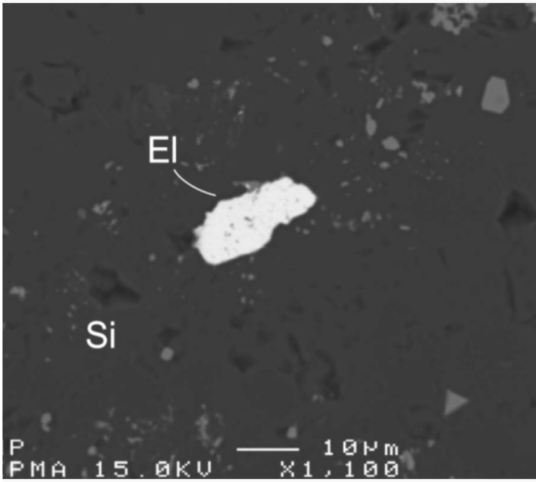
Bréchification : Or visible dans microfractures des pyrites











PARAGENÈSE MINÉRALE DU GISEMENT DE BEATTIE

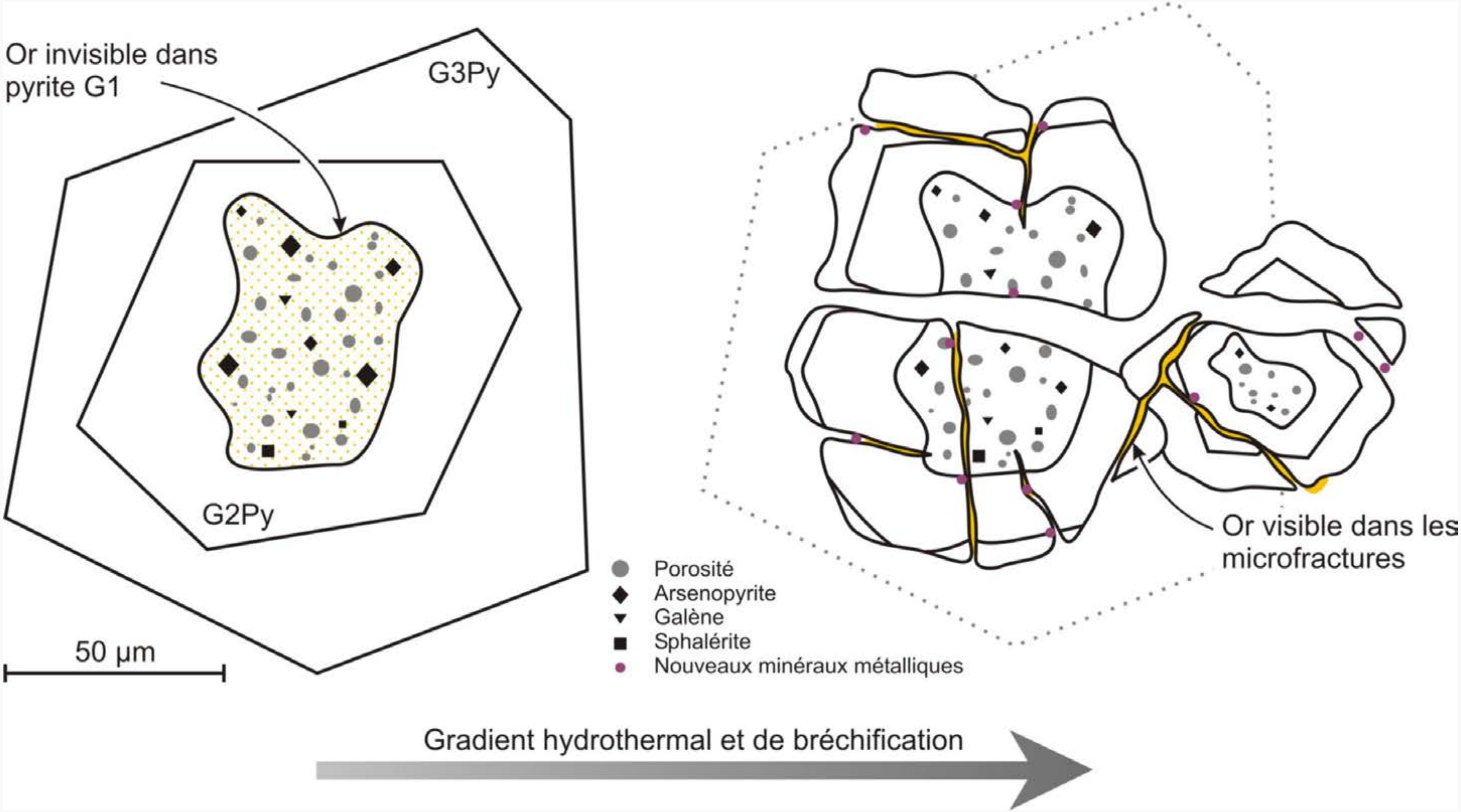
Minéralogie	Assemblage Fe-Ti	Martitisation	Sulfuration Aurifère	Sulfuration Non aurifère	Bréchification	Facies Supergene
Magnetite titanifère	━	─				
Ilmenite	━					
Titanite	━					
Apatite	━					
Barytine	━					
Leucoxene	─	━	─	─		
Hematite		━				
Pyrite arsénifère 1 - G1			━			
Pyrite 2 - G2				━ ─		
Pyrite 3 - G3				━	─	
Arsenopyrite			━		─	
Sphalerite			━			
Galène			━			
Chalcopyrite					━	
Enargite					━	
Tennantite-Tetrahedrite					━	
Coloradoite					━	
Hessite					━	
Electrum					━	
Barytine					━	
Goethite						━ ─
Contrôle de l'or			Lithologique		Structural	
Style aurifère			Or "Invisible"		Or Visible	
Altération	Chloritisation & faible Carbonatisation	Hématisation (Oxidation in situ)	Carbonatisation		Sericitisation & Silicification	Hydroxidation

━ Phase majeure

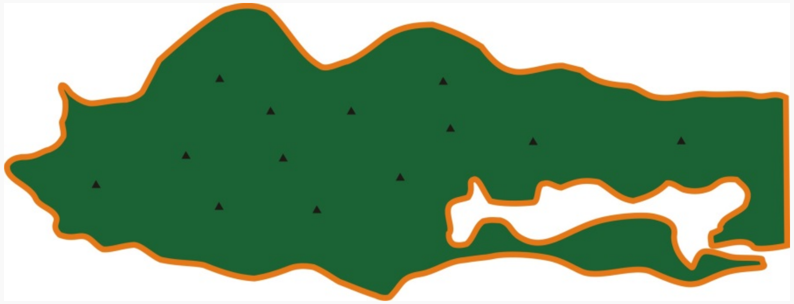
─ Phase mineure

⌇ Bréchification des pyrites

Remobilisation de l’or invisible

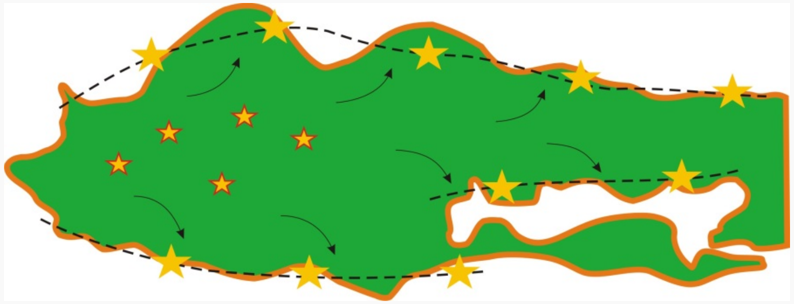


Conclusions



1- Oxydes de fer, sulfates = conditions oxydantes; absence d'or

2- Phase hydrothermale à CO2, As, Au.
Cristallisation de Au « invisible »
dans sulfures As disséminés dans la syenite.
Système plus réduit. Contrôle litho



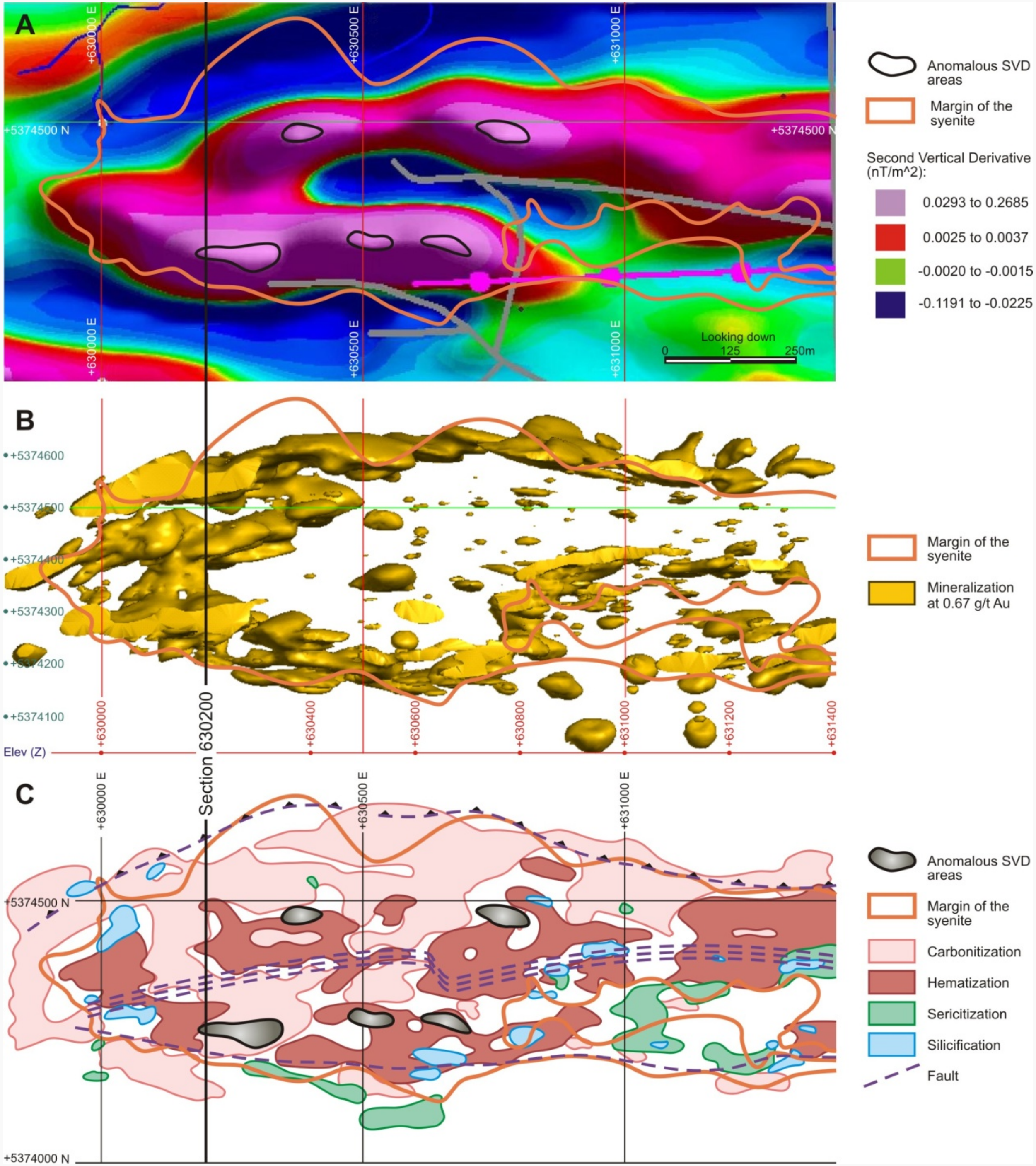
3- Phase hydrothermale à silice.
Redistribution d'une partie des sulfures
dans les corridors de déformation +
expulsion de l'or invisible qui devient visible.
Concentration des sulfures. Contrôle structural

MERCI

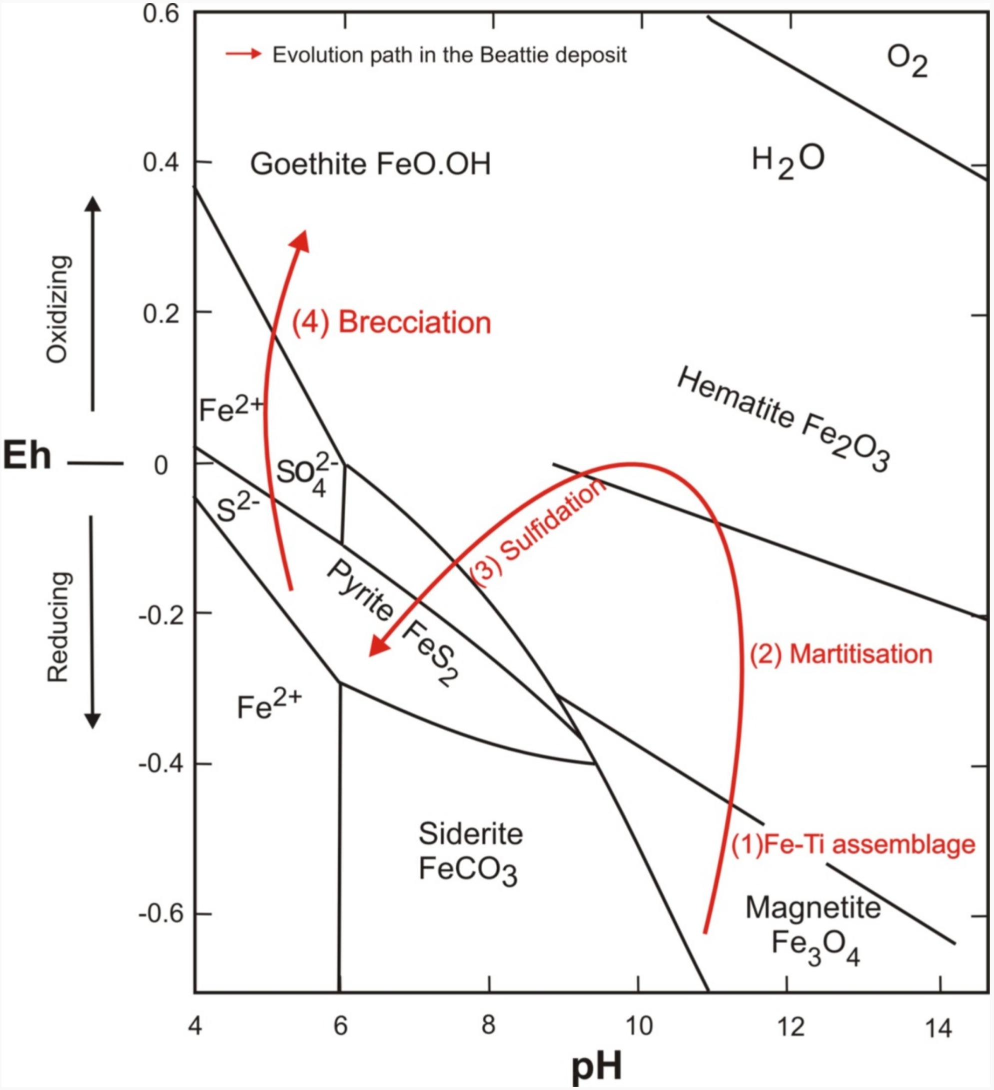
MAG (SVD)
Hétérogénéité

Corps minéralisés
à 0,67g/t Au

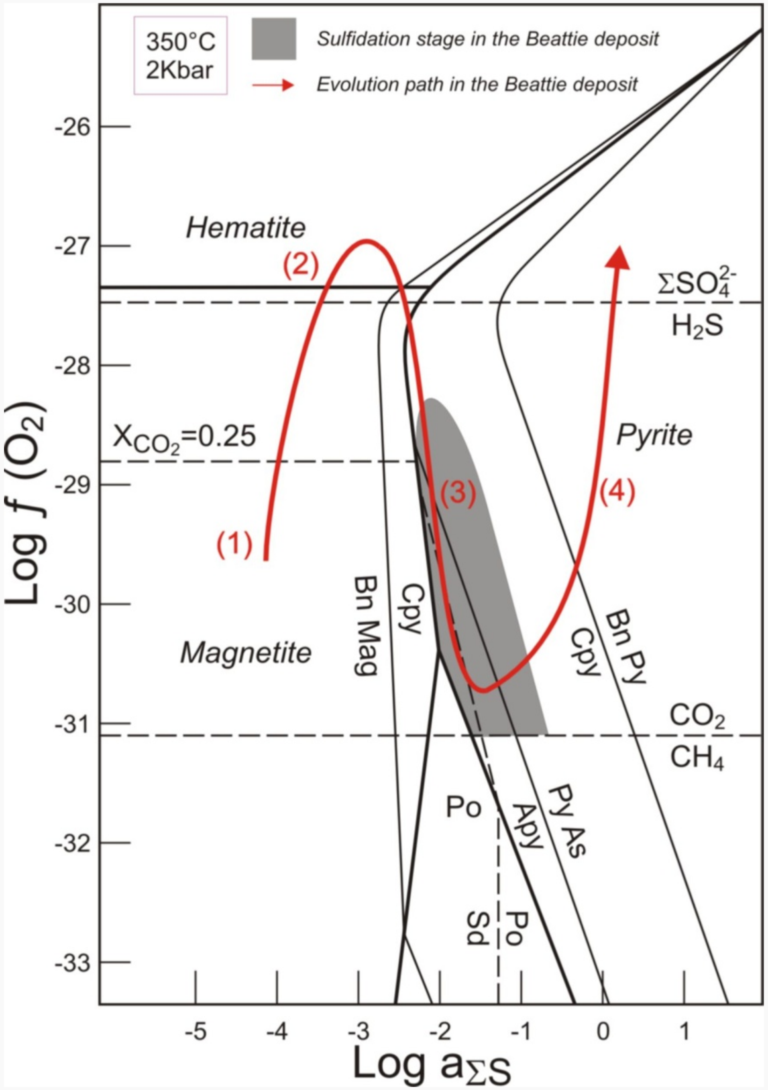
Halos d’altération
carbonatation,
hématisation,
séricitisation,
silicification



Évolution en “dents de scie”

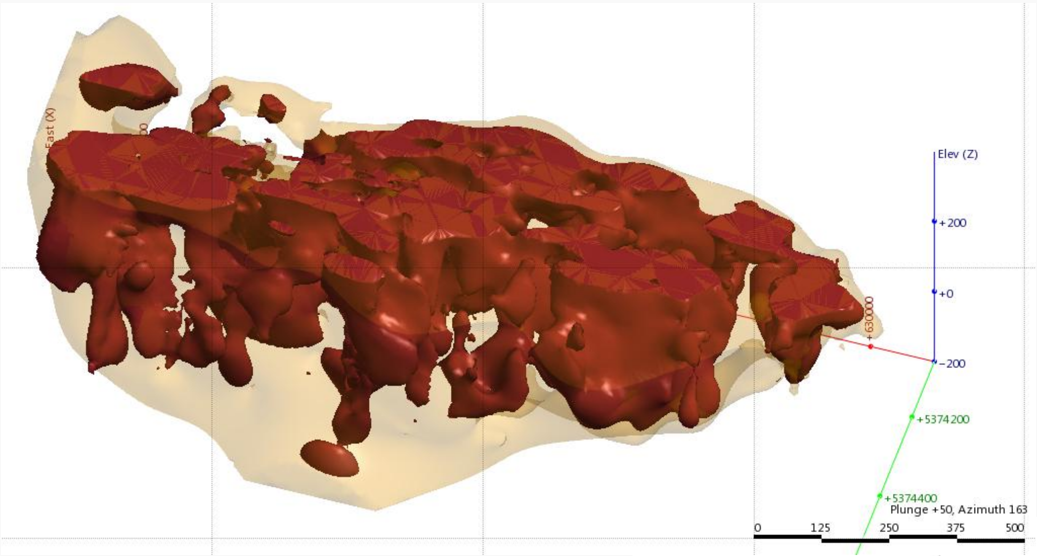


Modifié de Pélissonnier (2001)



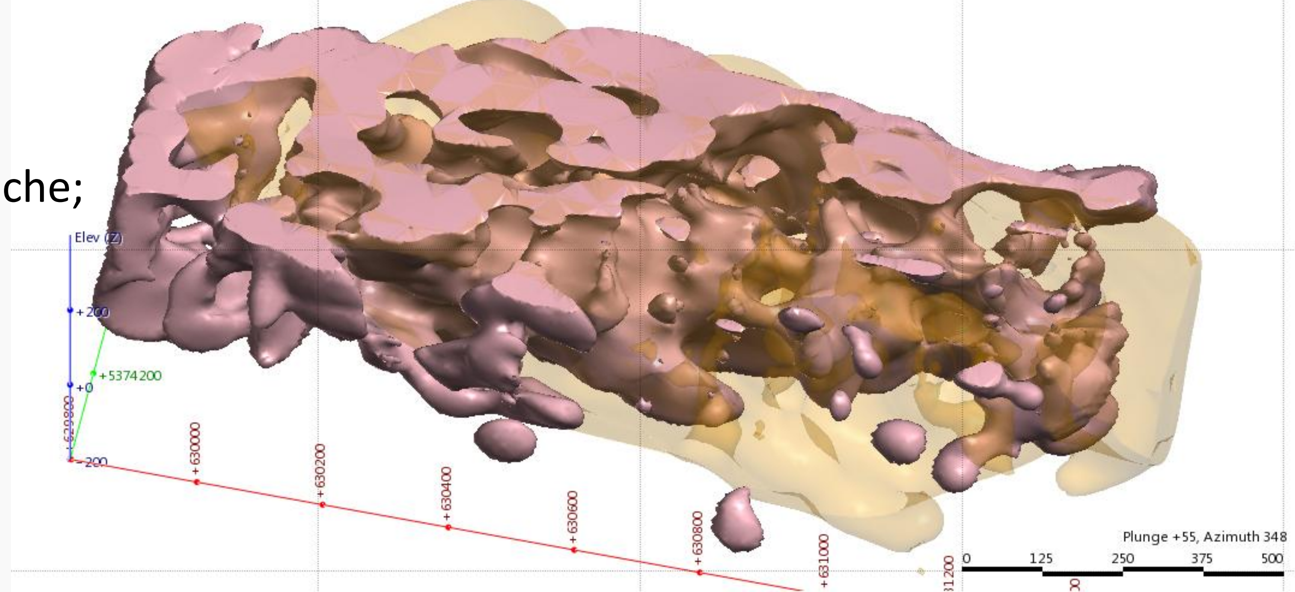
Modifié de Mikucki et Roberts (2004)

Altération et modélisation 3D

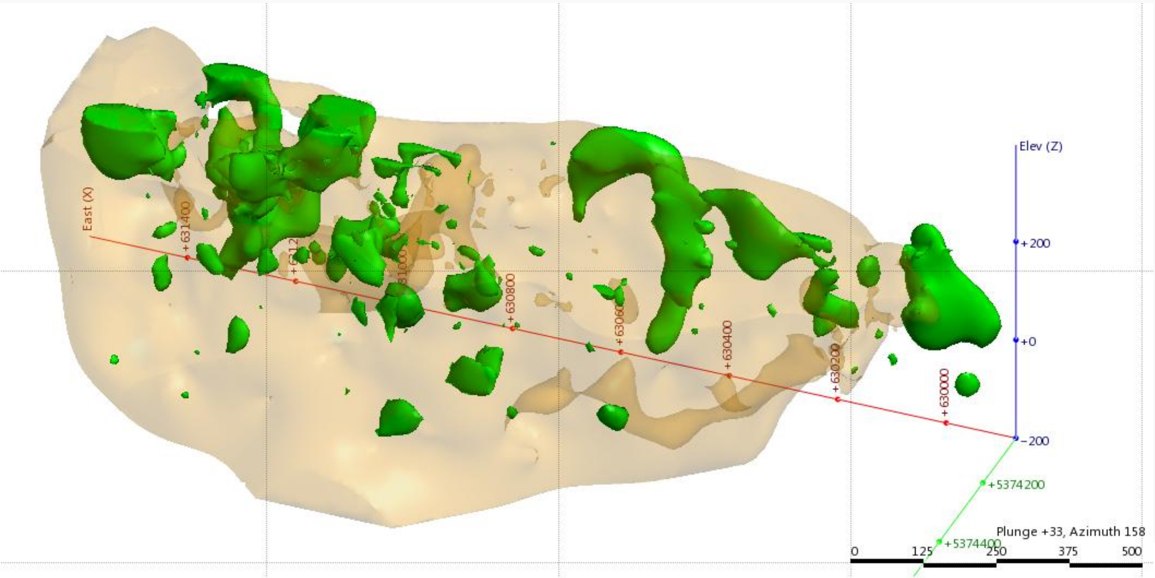


Hématisation: 62Mm^3 de roche; oxidation in-situ pas de métasomatisme

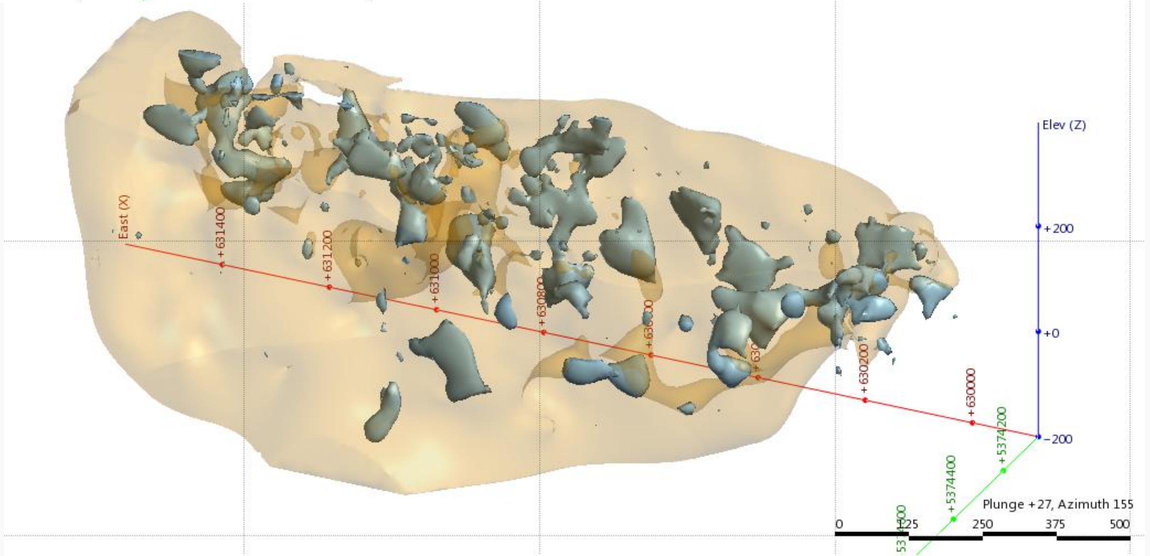
Carbonatisation: 151Mm^3 de roche; 1,54 Bm^3 de fluide riche en CO_2



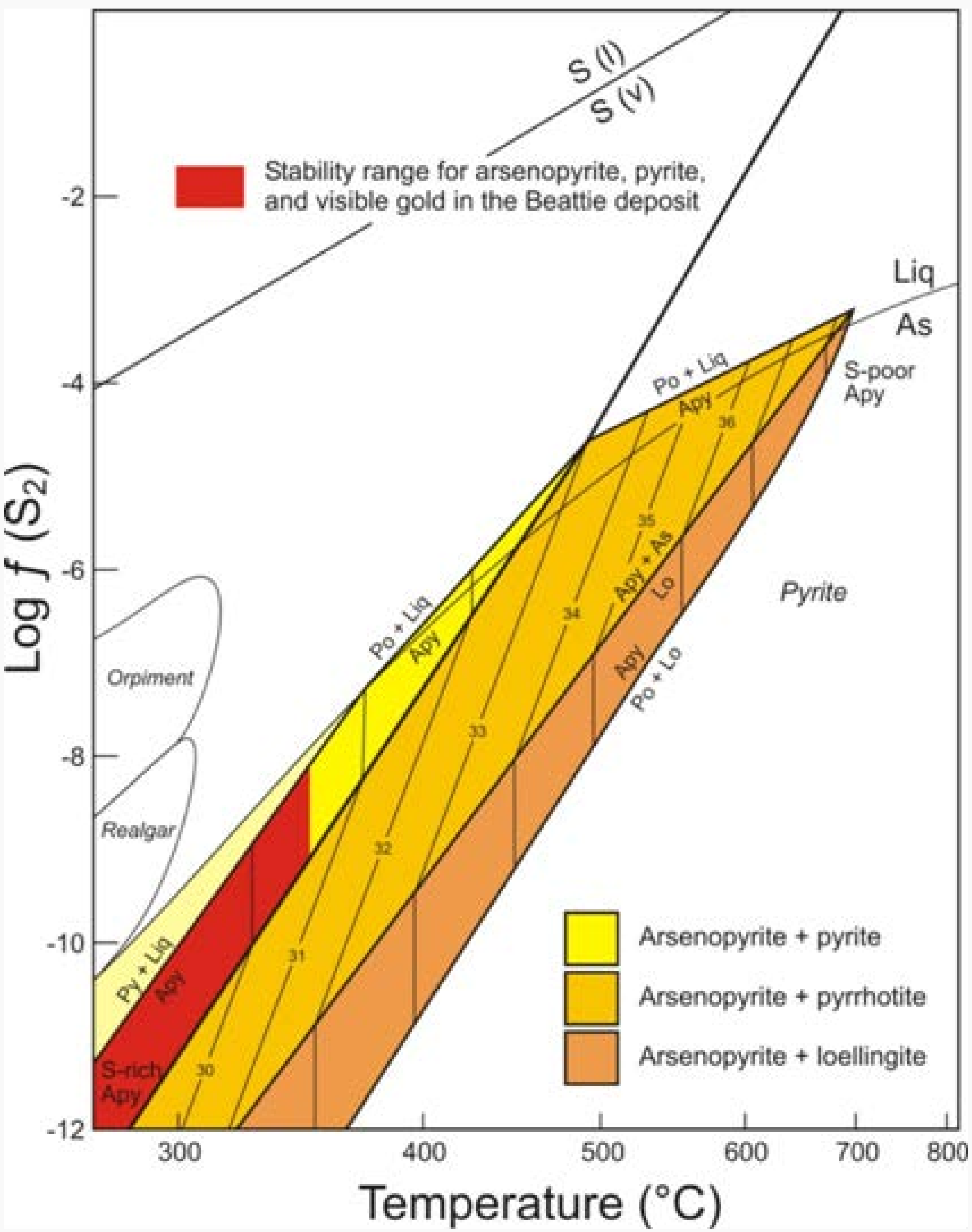
Altération et modélisation 3D



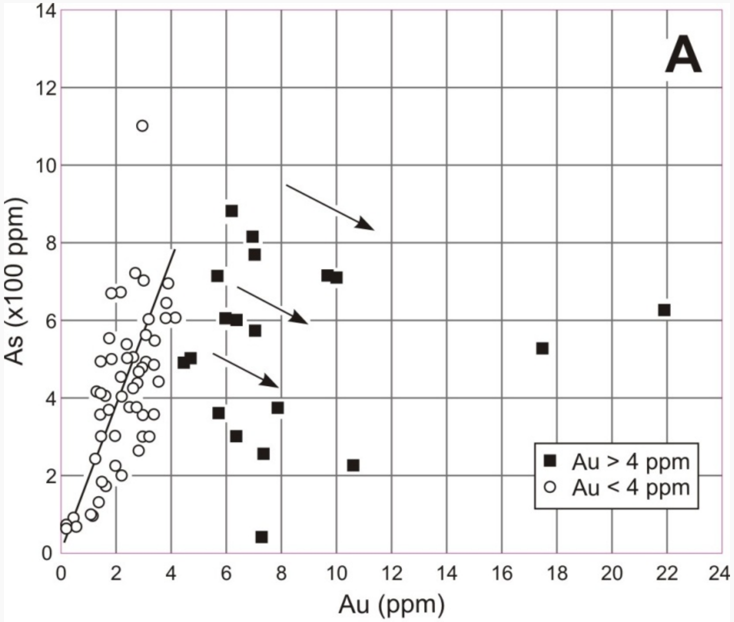
Séricitisation: 10Mm^3 de roche;
313 Mm^3 de fluide potassique

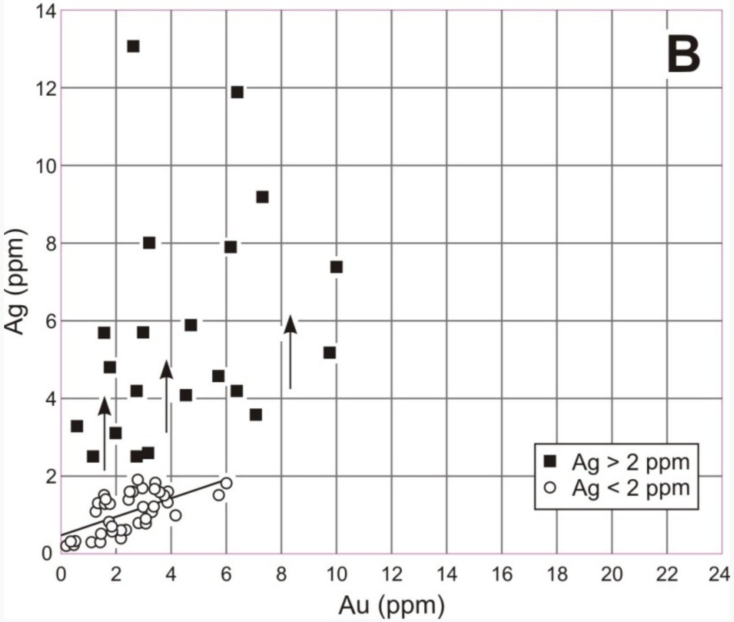


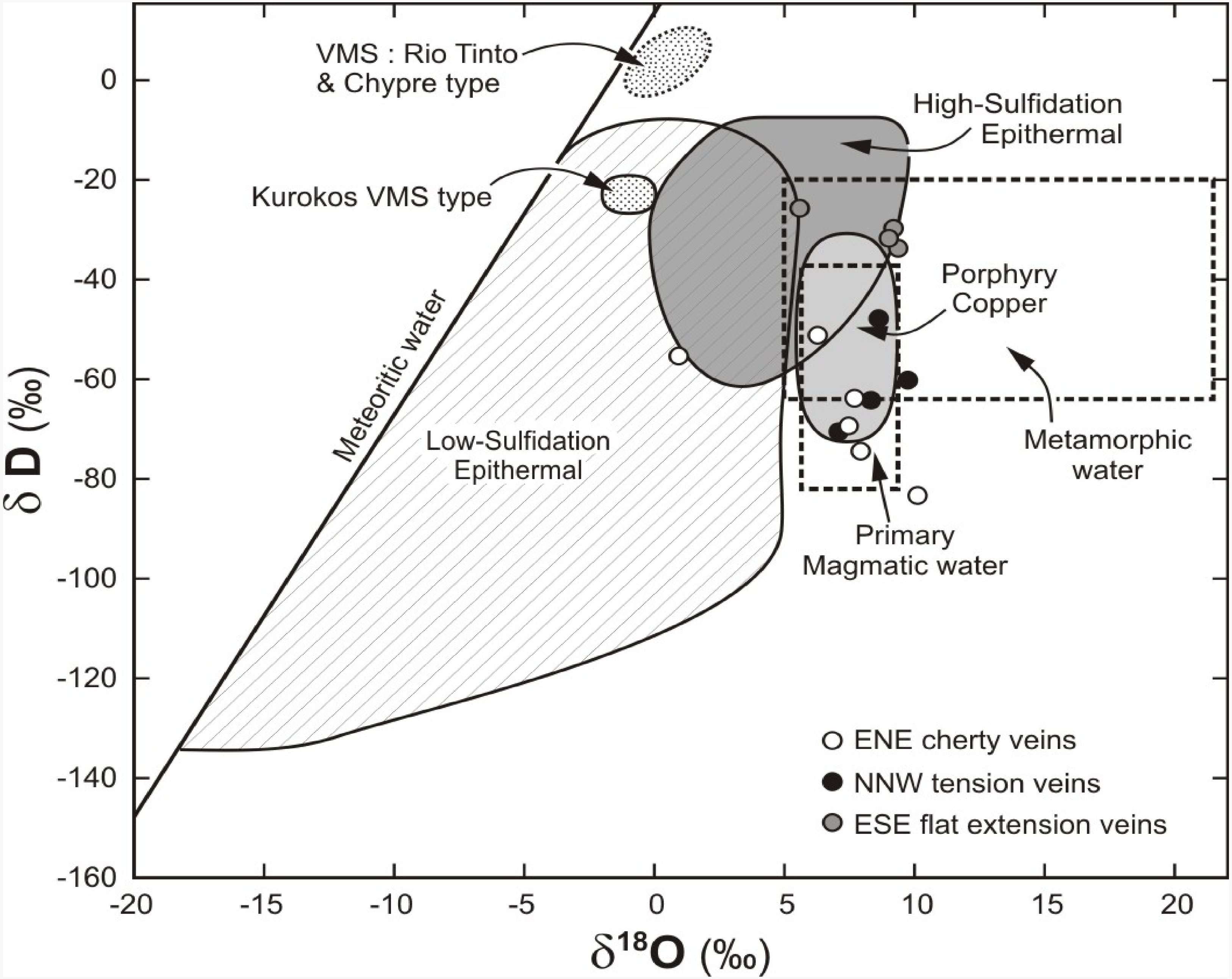
Silicification: 4Mm^3 de roche;
388 Mm^3 de fluide riche en silice



Géothermomètre sur Arsénopyrite hydrothermale (modifié de Barton, 1969; Kretschmar et Scott, 1976; Sharp et al., 1985)


A
As (x100 ppm)
Au (ppm)
0
2
4
6
8
10
12
14
16
18
20
22
24
■ Au > 4 ppm
○ Au < 4 ppm


B
Ag (ppm)
Au (ppm)
0
2
4
6
8
10
12
14
16
18
20
22
24
■ Ag > 2 ppm
○ Ag < 2 ppm



Modifié de Jébrak et Marcoux (2008), d’après McCuaig et Kerrich (1998)

Table 1. Main characteristics of the three vein styles in the Beattie deposit.

	ENE-WSW	ESE-WNW	NNW-SSE
Location	In the Fracture zone	Out of the Fracture zone	In the Fracture zone
Dip	steep to the south	shallow to the north	medium to steep to the west
Structure	massive	flat extension, open-space, pseudo-colloform	tension veins, periodic
Morphology	straight, narrow, irregular	sinuous, occasionnaly large	thin, occasionnaly folded and sheared
Composition	cherty quartz, few sericite	quartz, carbonate (calcite to ankerite), few sericite	quartz, carbonate (brown ankerite)
Carbonate Dissolution	none	yes, locally total	yes, partial
Gold Occurrence	fine disseminated in sulfides, >10 g/t Au	none	none
Breccia-related	breccia ore spatially related	hydraulic breccia	none
Relative Chronology	early	early (different from ENE veins)	late

Table 2. Main characteristics of the two mineralization styles in the Beattie deposit.

	Lithologically-controlled facies	**Structurally-controlled facies**
Nature of the Mineralization	disseminated sulfides	disseminated sulfides, small clusters of sulfides
Structure	massive, stockwork	replacement, breccia, veins, dike, silica corridors
Settings of the Mineralization	limited to the Beattie syenite	in second order breaks and shear zones adjacent and within the Beattie syenite
Alteration	iron-carbonatization	silicification, sericitization
Metallic Mineralogy	PY, APY, GL, SP	PY, APY, GL, SP, CP, EN, TT, CL, HS, EL
Elemental Association (+Au)	As, Zn, Pb, Ag	As, Zn, Pb, Ag, Te, Hg, Mo, Cu, Sb, Se
Gold Occurrence	invisible gold included in lattice bounds of arsenian pyrite and arsenopyrite	electrum in microfractures and porosity of brecciated pyrite
Au Grades	<2.5g/t Au	>2.5g/t Au ; regularly higher than 5g/t Au
Sulfide Contents	5 to 8%	10 to 20%
Au/Ag	1.2	0.9
Process	Magmatic stage : syn-sulfidation	Hydrothermal stage : breccia facies

Abbreviations: PY:Pyrite; APY:Arsenopyrite; GL:Galena; SP:Sphalerite; CP:Chalcopyrite; EN:Enargite; TT:Tennantite-Tetrahedrite; CL:Coloradoite; HS:Hessite; EL:Electrum

Table 3. Electron microprobe data (wt %) for the two mineralization styles in the Beattie deposit.

Facies	Sample type - ID	Ag %	Se %	Fe %	S %	As %	Hg %	Te %	Au %	Cu %	Total %
Lithologically-controlled facies	Pyrite - L1	0.016	0.018	45.5	50.8	3.80	0.020	0.000	0.027	0.049	100.26
	Pyrite - L2	0.000	0.012	46.3	53.3	1.02	0.000	0.000	0.009	0.001	100.65
	Pyrite - L3	0.004	0.009	45.4	52.1	1.69	0.035	0.000	0.012	0.280	99.45
	Pyrite - L4	0.000	0.015	45.7	50.4	4.40	0.022	0.005	0.013	0.028	100.61
	Pyrite - L5	0.000	0.017	46.7	53.4	0.381	0.040	0.015	B.D.L	0.036	100.60
	Pyrite - L6	0.009	0.015	47.1	53.6	0.014	0.003	0.008	B.D.L	0.000	100.74
	Pyrite - L7	0.008	0.023	46.1	51.4	2.57	0.002	0.000	0.020	0.006	100.10
	Pyrite - L8	0.022	0.015	46.2	52.2	1.35	0.008	0.000	0.015	0.011	99.83
	Pyrite - L9	0.000	0.004	46.7	52.6	0.439	0.000	0.015	B.D.L	0.000	99.69
	Pyrite - L10	0.002	0.013	45.6	50.0	4.71	0.019	0.006	0.018	0.173	100.46
	Pyrite - L11	0.000	0.008	47.0	53.3	0.058	0.011	0.012	B.D.L	0.007	100.38
	Arsenopyrite - L12	0.000	0.072	36.6	27.6	40.5	0.048	0.118	0.010	0.002	104.90
	Arsenopyrite - L13	0.000	0.210	35.2	20.6	37.8	0.008	0.009	0.042	0.008	93.96
	Pyrite - L14	0.011	0.007	46.1	51.2	2.87	0.029	0.000	0.008	0.023	100.21
	Pyrite - L15	0.000	0.017	46.2	52.0	1.95	0.004	0.002	0.008	0.015	100.15
	Pyrite - L16	0.000	0.004	46.8	53.3	0.020	0.000	0.000	B.D.L	0.000	100.12
	Pyrite - L17	0.001	0.011	46.1	53.4	0.162	0.022	0.000	B.D.L	0.000	99.74
	Pyrite - L18	0.004	0.009	45.7	51.9	1.92	0.000	0.000	0.011	0.004	99.58
Structurally-controlled facies	Arsenopyrite - S1	0.000	0.131	35.9	21.4	42.5	0.061	0.019	B.D.L	0.000	100.08
	Arsenopyrite - S2	0.008	0.138	34.9	21.5	42.4	0.061	0.032	0.007	0.000	99.02
	Pyrite - S3	0.037	0.014	46.0	52.8	0.551	0.000	0.000	B.D.L	0.362	99.80
	Pyrite - S4	0.022	0.007	45.4	51.5	2.45	0.005	0.000	B.D.L	0.909	100.24
	Pyrite - S5	0.000	0.008	46.5	53.0	0.498	0.027	0.000	B.D.L	0.001	100.01
	Pyrite - S6	0.025	0.088	46.9	52.9	0.485	0.017	0.000	B.D.L	0.004	100.36
	Pyrite - S7	0.002	0.011	46.0	52.2	1.75	0.008	0.000	B.D.L	0.050	100.03
	Pyrite - S8	0.008	0.010	41.5	47.6	1.64	0.000	0.011	B.D.L	0.024	91.07
	Electrum - E1	15.23	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	85.71	N.A.	100.940
	Electrum - E2	15.24	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	84.75	N.A.	99.990
	Electrum - E3	12.68	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	87.30	N.A.	99.980
	Electrum - E4	15.10	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	85.22	N.A.	100.320
	Electrum - E5	14.96	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	85.19	N.A.	100.150
	Electrum - E6	15.25	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	85.19	N.A.	100.440
	Electrum - E7	15.53	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	85.05	N.A.	100.580

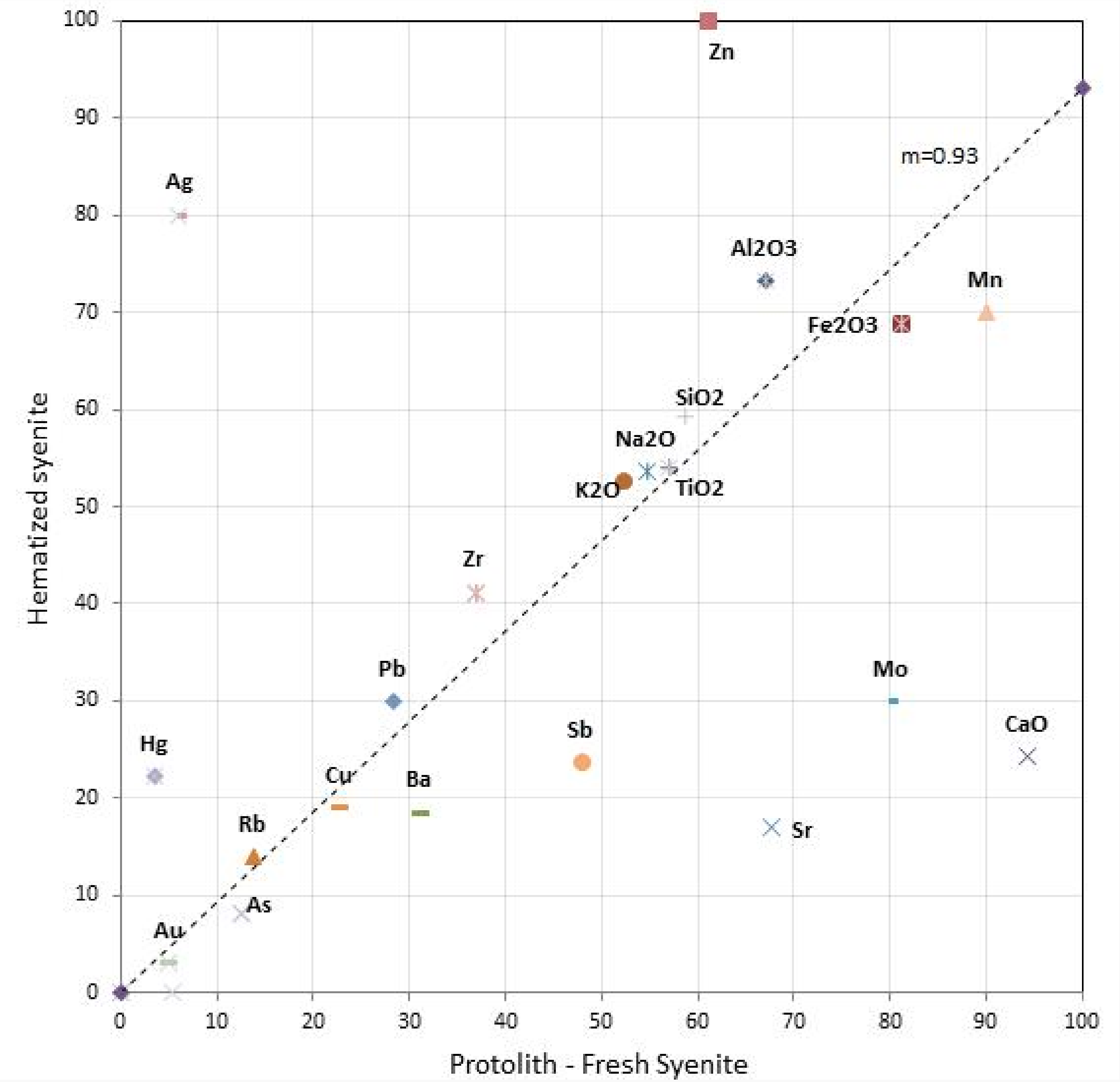
Table 4. Chemical composition of the main alteration facies and mineralization styles in the Beattie deposit.

Facies	Fresh Syenite		Fresh basalt	Hematized syenite		Iron-carbonatized syenite		Sericitized syenite		Brecciated syenite - silicification		Cherty vein	Poly-metallic vein	Trachytic syenite dike	Silicified basalt	
Ore control						Lithologically-controlled facies		Structurally-controlled facies								
Element	Avg. (n=5)	Std. dev.	Avg. (n=10*)	Avg. (n=4)	Std. dev.	Avg. (n=9)	Std. dev.	Avg. (n=8)	Std. dev.	Avg. (n=39)	Std. dev.	One sample	One sample	One sample	Avg. (n=6)	Std. dev.
SiO2 (%)	57.76	1.32	52.23	60.73	1.24	55.67	2.04	55.10	2.45	75.43	8.02	92.20	65.50	53.55	57.78	4.04
Al2O3 (%)	16.40	1.20	14.22	17.93	0.50	14.86	0.69	14.80	2.06	8.13	3.67	2.00	3.08	14.44	12.07	1.04
Fe2O3 (%)	5.22	0.30	14.13	4.90	0.46	4.73	0.39	4.29	0.83	3.01	1.41	1.78	2.03	4.75	8.80	2.51
CaO (%)	3.80	1.45	8.35	1.13	0.82	7.63	1.72	4.26	1.07	2.12	1.55	0.14	1.16	4.33	4.05	2.04
MgO (%)	1.40	0.52	5.86	0.54	0.17	0.97	0.31	1.63	0.18	0.40	0.44	0.09	0.19	1.67	1.37	0.82
Na2O (%)	5.47	0.17	3.09	4.67	0.47	1.01	0.95	1.70	0.53	0.30	0.21	0.02	0.05	0.37	0.56	0.43
K2O (%)	4.55	0.66	0.27	6.25	1.20	10.45	2.04	8.84	1.55	6.55	3.26	0.89	2.16	10.60	5.86	2.13
Cr2O3 (%)	0.00	0.00		0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.01		0.01	0.00
TiO2 (%)	0.57	0.02	1.52	0.56	0.05	0.48	0.03	0.49	0.27	0.40	0.25	0.08	0.09	0.50	1.19	0.25
MnO (%)	0.11	0.03	0.21	0.06	0.02	0.16	0.03	0.13	0.03	0.06	0.05	0.01	0.03	0.12	0.15	0.09
P2O5 (%)	0.32	0.07	0.12	0.26	0.11	0.28	0.01	0.27	0.04	0.20	0.11	0.06	0.07	0.15	0.46	0.34
SrO (%)	0.18	0.05		0.06	0.01	0.08	0.03	0.10	0.02	0.03	0.01	0.01	0.01		0.02	0.01
BaO (%)	0.33	0.07		0.23	0.01	0.25	0.05	0.32	0.08	0.14	0.09	0.01	0.03		0.04	0.01
C (%)	0.94	0.48		0.44	0.11	1.45	0.25	1.66	0.19	0.95	0.46	0.05	0.31	1.46	1.23	0.63
S (%)	0.04	0.01	0.15	0.07	0.05	1.12	0.50	1.42	0.70	1.67	0.97	0.56	1.59	2.03	2.26	0.90
LOI (%)	2.99	1.62	2.84	2.05	0.91	4.25	0.85	6.18	0.55	2.84	1.33	1.09	17.00	7.29	6.15	1.96
Total (%)	98.40	0.91		99.10	2.42	98.30	1.96	98.10	0.94	99.85	1.06	98.40	91.40	97.76	98.46	1.81
Ba (ppm)	2964.50	667.56	86.00	2099.50	250.12	2072.00	429.45	2720.00	691.71	978.00	198.18	124.00	236.00	3100.00	302.30	84.15
Ce (ppm)	242.50	6.05	21.83	251.60	17.66	221.00	14.91	220.00	58.17	118.77	22.11	49.40	43.10	275.00	45.62	17.03
Cr (ppm)	10.00	0.00	173.25	10.00	0.00	10.00	0.00	10.00	0.00	12.24	16.89	30.00	10.00	25.00	8.00	2.31
Cs (ppm)	5.15	1.78		3.59	1.49	3.57	0.62	2.96	0.69	2.11	0.54	0.33	0.83	2.70	3.24	1.78
Dy (ppm)	6.73	0.52		6.29	0.66	5.90	0.24	5.73	1.03	3.51	0.70	1.60	1.42		6.55	2.07
Er (ppm)	3.10	0.29		3.03	0.40	2.98	0.13	2.92	0.82	1.74	0.28	0.59	0.71		4.05	1.26
Eu (ppm)	4.20	0.17		4.17	0.29	3.89	0.15	3.69	0.67	2.22	0.50	1.23	0.91	4.70	1.85	0.62
Ga (ppm)	24.50	2.45	19.69	28.13	1.53	22.60	1.42	24.00	2.18	14.90	4.54	10.70	6.10	21.00	18.82	2.35
Gd (ppm)	13.33	1.96		14.16	2.28	13.86	0.69	13.60	2.01	7.39	2.60	3.94	3.05		7.10	2.51
Hf (ppm)	9.25	0.38		9.70	0.44	8.27	0.38	8.40	1.04	4.57	1.37	0.90	2.80	9.80	5.50	1.60
Ho (ppm)	1.18	0.12		1.08	0.16	1.02	0.06	1.01	0.30	0.67	0.05	0.23	0.23		1.36	0.45
La (ppm)	115.05	4.10	7.09	122.98	6.03	105.40	6.08	107.00	28.74	58.17	12.91	22.80	21.40	150.00	19.62	6.99
Lu (ppm)	0.42	0.05		0.37	0.06	0.38	0.04	0.39	0.14	0.25	0.02	0.06	0.08	0.46	0.57	0.18
Nb (ppm)	12.45	0.53	5.54	12.25	1.13	10.40	0.58	10.80	2.14	6.23	2.18	1.10	2.10	11.00	10.86	4.07
Nd (ppm)	103.15	3.83		103.23	9.88	89.60	5.09	90.20	21.93	51.37	7.90	24.70	19.00	112.00	25.54	9.25
Pr (ppm)	28.70	1.36		29.66	2.42	25.50	1.77	26.50	6.42	14.35	2.91	6.36	5.28		6.28	2.41
Rb (ppm)	118.45	21.07	8.46	151.88	14.80	185.90	21.38	195.50	29.64	106.83	38.00	23.70	42.70	179.00	116.42	27.37
Sm (ppm)	17.74	1.10		17.32	1.91	15.45	1.07	16.10	2.98	8.96	2.06	5.16	3.42	18.90	6.22	2.27
Sn (ppm)	2.00	0.00		2.00	0.00	1.29	0.66	1.00	0.35	0.87	0.23	1.00	3.00	15.00	1.60	0.80
Sr (ppm)	1959.00	638.32	118.46	544.30	45.89	745.00	215.44	947.00	210.74	147.99	130.26	36.50	82.00	420.00	151.54	85.03
Ta (ppm)	0.50	0.04		0.48	0.05	0.44	0.05	0.40	0.20	0.33	0.06	0.10	0.10	1.00	0.76	0.29
Tb (ppm)	1.55	0.11		1.53	0.14	1.43	0.06	1.41	0.14	0.82	0.22	0.45	0.33	1.30	1.10	0.37
Th (ppm)	25.15	2.07		24.55	4.09	22.20	1.51	22.80	7.73	19.33	2.34	1.81	4.28	26.90	1.79	0.68
Tl (ppm)	0.65	0.09		0.88	0.53	1.70	0.45	1.50	0.51	1.13	0.81	0.60	0.50		2.00	0.72
Tm (ppm)	0.44	0.06		0.38	0.06	0.36	0.04	0.39	0.13	0.23	0.01	0.07	0.08		0.56	0.19
U (ppm)	6.76	0.77		5.98	1.28	6.05	0.88	6.78	1.03	9.49	1.70	3.64	1.26	10.90	1.26	1.10
V (ppm)	133.00	29.62	396.62	123.25	27.35	125.70	43.76	144.00	40.90	34.26	15.24	260.00	51.00	355.00	236.60	133.80
W (ppm)	1.45	0.74		6.75	4.65	11.10	3.28	12.00	4.23	9.79	0.72	3.00	2.00	28.00	25.80	17.99
Y (ppm)	34.55	3.00	37.08	32.00	3.65	29.39	1.82	29.90	7.21	19.13	1.46	6.70	6.70	35.00	36.72	12.95
Yb (ppm)	2.74	0.28		2.49	0.38	2.51	0.19	2.44	0.86	1.57	0.07	0.43	0.58	3.00	3.75	1.14
Zr (ppm)	356.75	29.61	114.46	386.68	18.45	327.30	12.92	317.00	47.65	181.43	54.99	30.00	110.00	365.00	202.80	56.98
Au (ppm)	0.01	0.01	0.00	0.01	0.01	2.14	0.53	1.38	0.09	6.90	3.50	10.60	120.00	6.07	4.46	2.41
As (ppm)	9.10	2.82	3.56	15.33	6.62	290.40	124.01	226.12	175.00	812.00	307.08	223.00	>250	362.00	4420.00	2189.79
Bi (ppm)	0.42	0.10		0.60	0.20	1.16	0.25	0.68	0.24	0.85	0.31	0.30	1.29	2.00	0.07	0.04
Hg (ppm)	0.05	2.08		0.45	0.47	2.35	1.89	1.75	0.38	21.15	12.41	170.00	>25.0	6.31	15.79	17.80
Sb (ppm)	1.30	0.35		1.64	0.88	2.95	0.93	7.50	3.90	8.70	4.36	41.10	>250	23.50	12.93	7.06
Se (ppm)	0.45	0.13		0.55	0.19	1.59	0.33	1.80	0.79	3.70	1.18	2.70	107.00	3.00	3.98	1.59
Te (ppm)	0.01	0.11		0.01	0.01	0.95	0.51	1.43	0.51	133.00		117.50	>250		6.54	3.36
Ag (ppm)	1.03	0.77	0.69	0.68	0.25	1.79	1.08	2.86	1.66	7.58	2.74	44.60	3580.00	3.00	2.58	1.06
Cd (ppm)	0.18	0.11		0.28	0.05	0.30	0.00	0.30	0.07	0.48	0.09	0.30	7.60	0.50	0.30	0.00
Co (ppm)	9.00	1.41	45.85	7.00	2.65	10.00	1.17	9.00	2.31	13.70	4.47	7.00	2.00	10.00	22.00	4.69
Cu (ppm)	18.90	4.45	96.46	24.95	4.93	29.20	5.61	36.79	13.78	71.57	29.33	125.00	7920.00	43.00	77.60	28.36
Mo (ppm)	1.10	0.44		0.83	0.45	11.90	10.30	58.30	11.72	177.41	161.56	175.00	29.00	44.00	23.00	29.31
Ni (ppm)	5.20	1.76	57.73	5.10	0.84	5.60	1.41	4.00	1.31	4.54	3.91	6.00	3.00	11.00	14.00	17.17
Pb (ppm)	34.15	6.70	9.90	34.30	7.71	36.40	4.34	62.00	29.14	36.40	19.74	35.00	22.00	50.00	29.00	26.04
Zn (ppm)	75.50	17.02	111.08	73.75	28.70	59.70	17.80	92.00	13.94	58.67	34.52	38.00	1040.00	53.00	96.80	58.20

Notes: Avg. = Average, Std. Dev.: Standard deviation; all analysis performed both at ACME Lab, Vancouvers, and ALS Chemex, Val d'or. Basalts belong to the Deguisier formation to the north of the syenite. * data from Goutier and Lacroix (1992) - MB 92-06. For the polymetallic vein, Osisko reported 341g/t Au (same intersection that presented in this article): http://www.osisko.com/2010/11/osisko-and-clifton-star-intersect-70-metres-averaging-1-94-gt-au-at-duparquet/

Table 5. Isotopic results for quartz veins in the Beattie deposit.

Sample	Vein type	δO18 (‰ VSMOW)	δO18 fluid at 350°c (‰ VSMOW)	δD (‰ VSMOW)
6-A	ENE-WSW cherty	13.35	7.30	-67
4-B	ENE-WSW cherty	13.71	7.67	-74
Iso2	ENE-WSW cherty	13.2	7.2	-63
Iso4	ENE-WSW cherty	12.2	6.2	-53
Iso8	ENE-WSW cherty	16.1	10.1	-83
Iso10	ENE-WSW cherty	6.9	0.9	-57
1-C	ESE-WNW	14.56	8.52	-32
Iso1	ESE-WNW	14.9	8.9	-36
Iso6	ESE-WNW	14.8	8.8	-30
Iso9	ESE-WNW	11.7	5.7	-26
4-D	NNW-SSE tension	14.25	8.21	-63
Iso3	NNW-SSE tension	15.5	9.5	-60
Iso5	NNW-SSE tension	13.1	7.1	-69
Iso7	NNW-SSE tension	14.3	8.3	-47



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Mn
Fe2O3
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Na2O
K2O
TiO2
Zr
Pb
Mo
CaO
Sb
Hg
Cu
Ba
Sr
Rb
As
Au
Hematized syenite
Protolith - Fresh Syenite
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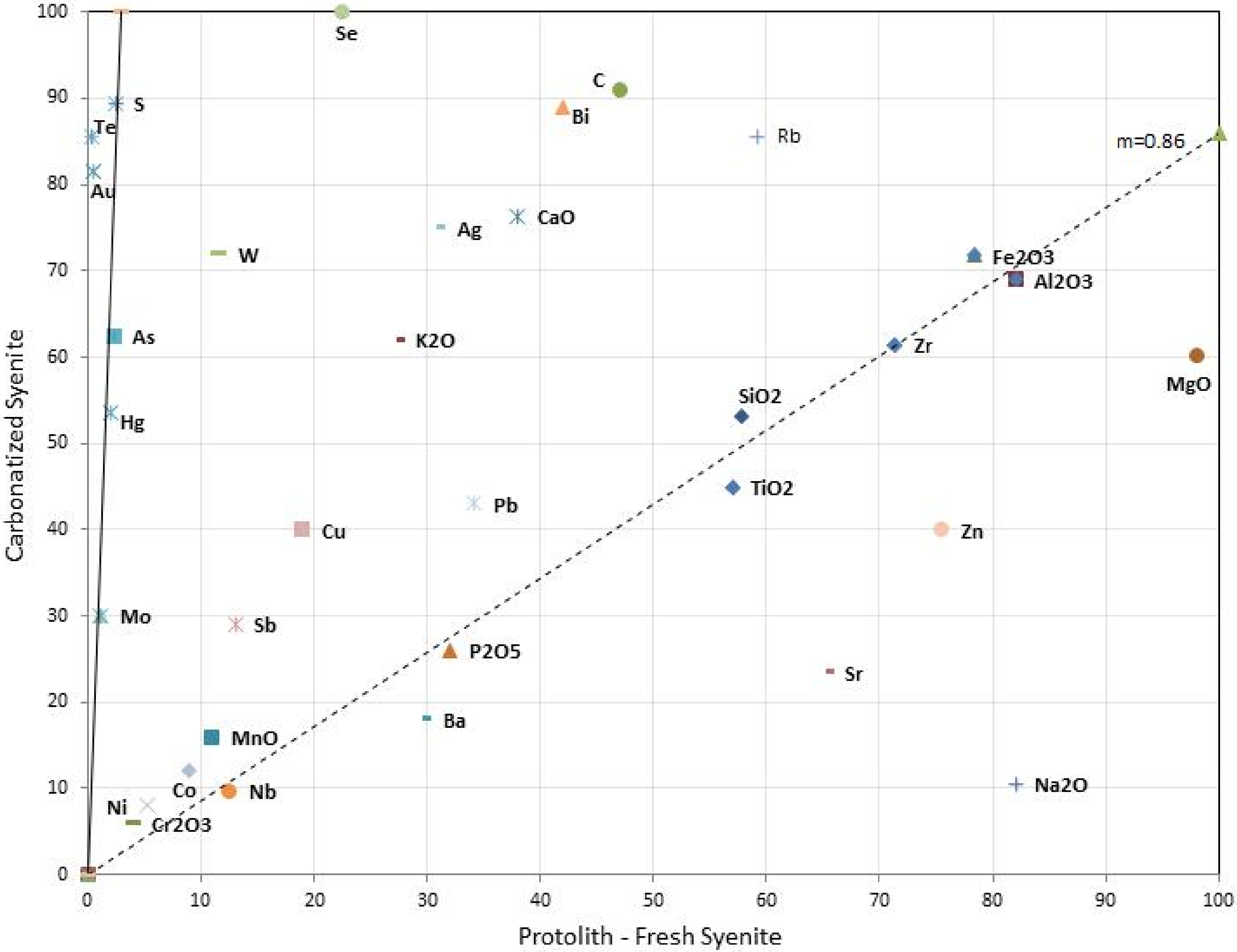
30
40
50
60
70
80
90
100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80
70
60
50
40
30
20
10
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0
10
20
30
40
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60
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80
90
100
Carbonatized Syenite
Protolith - Fresh Syenite
Se
C
Bi
S
Te
Au
Rb
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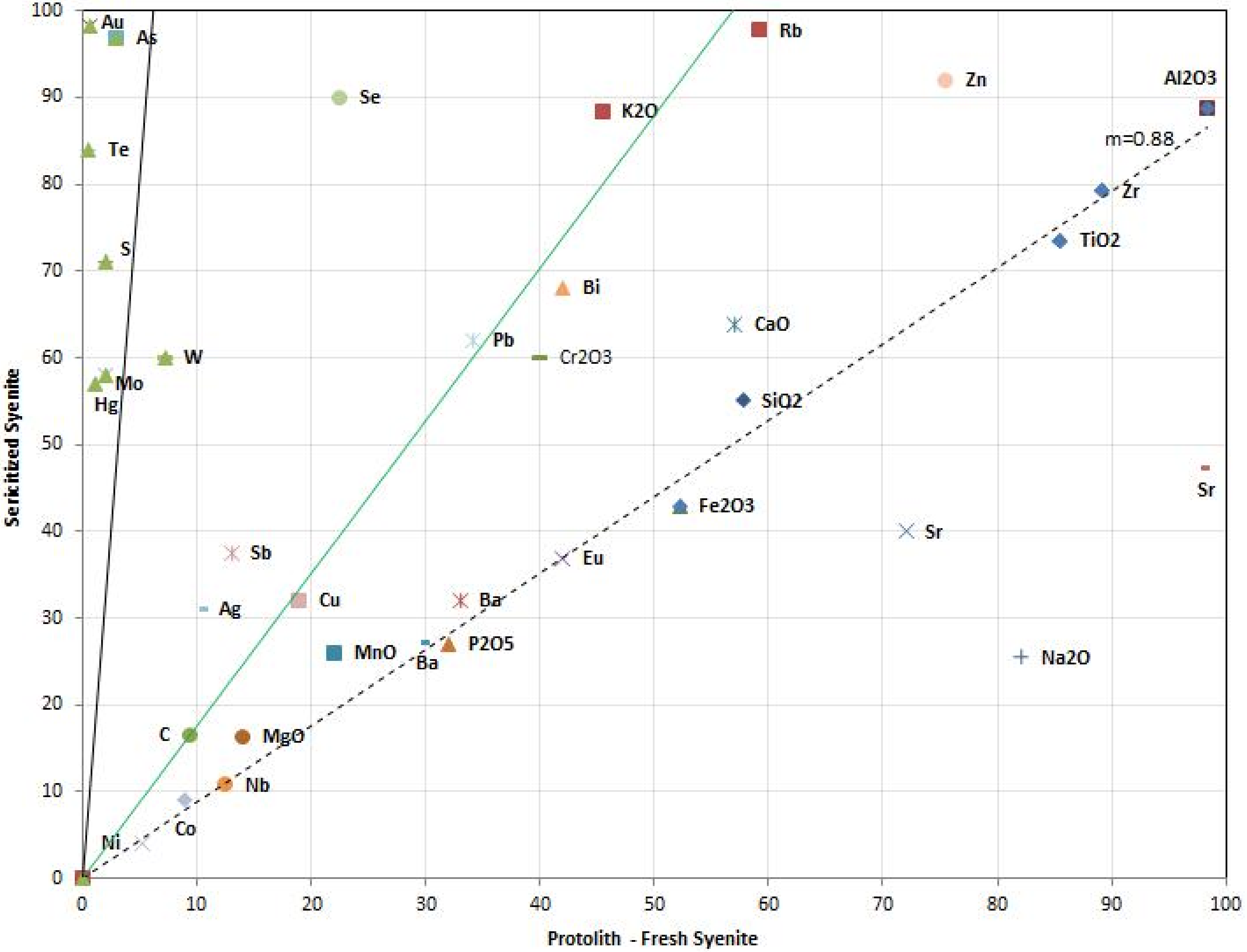
CaO
Ag
W
Fe2O3
Al2O3
As
K2O
Zr
MgO
SiO2
Hg
TiO2
Pb
Cu
Zn
Mo
Sb
P2O5
Sr
Ba
MnO
Co
Nb
Na2O
Ni
Cr2O3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Zr
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W
Mo
Hg
SiO2
Sr
Fe2O3
Sr
Sb
Eu
Ag
Cu
Ba
MnO
Ba
P2O5
Na2O
C
MgO
Nb
Co
Ni
Sericitized Syenite
Protolith - Fresh Syenite
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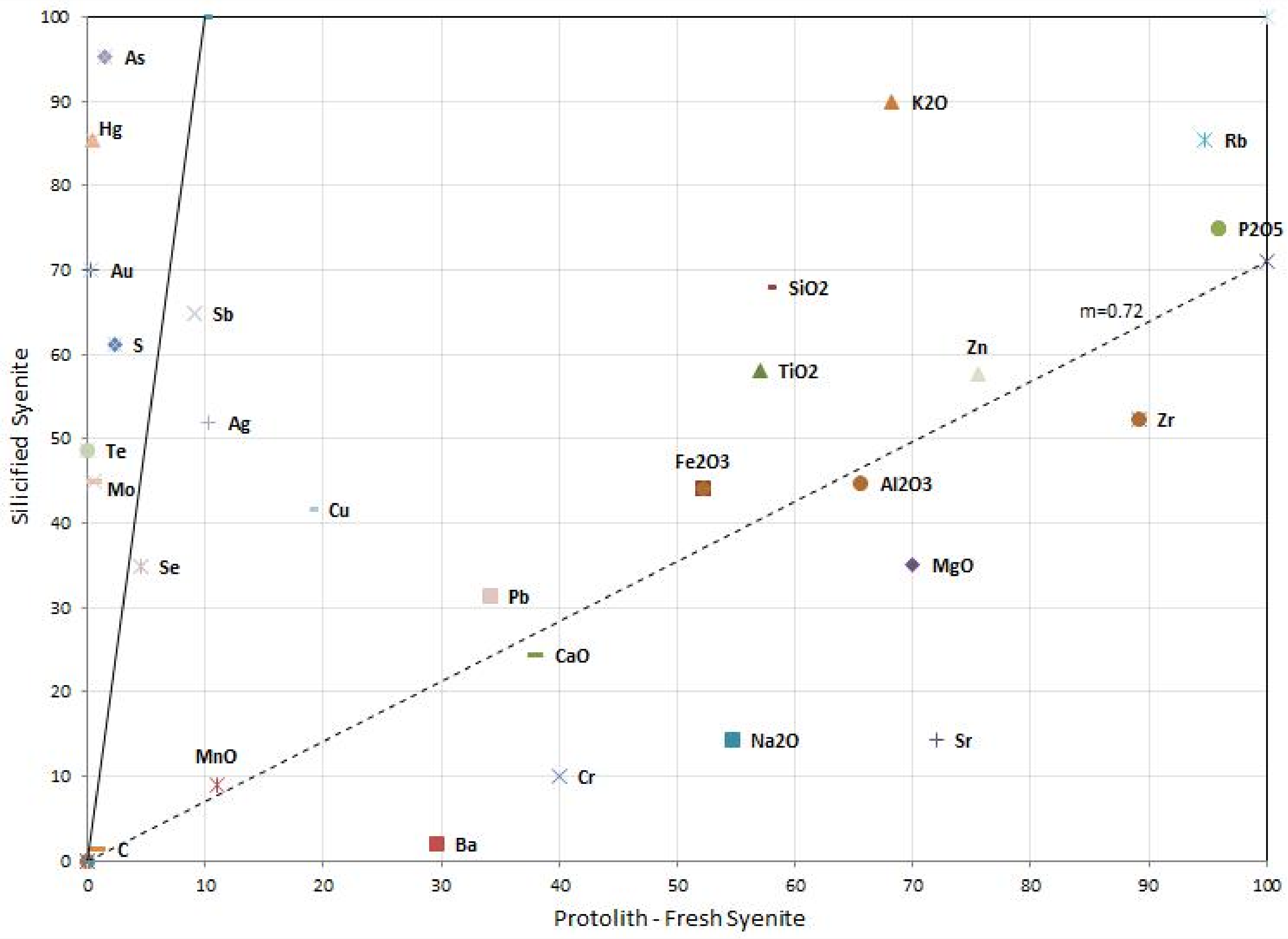
20
30
40
50
60
70
80
90
100



As
Hg
Au
Sb
S
Ag
Te
Mo
Cu
Se
Pb
CaO
MnO
C
Ba
Cr
Na2O
Sr
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SiO2
TiO2
K2O
Al2O3
MgO
Zn
Zr
Rb
P2O5
m=0.72
Silicified Syenite
Protolith - Fresh Syenite
0
10
20
30
40
50
60
70
80
90
100