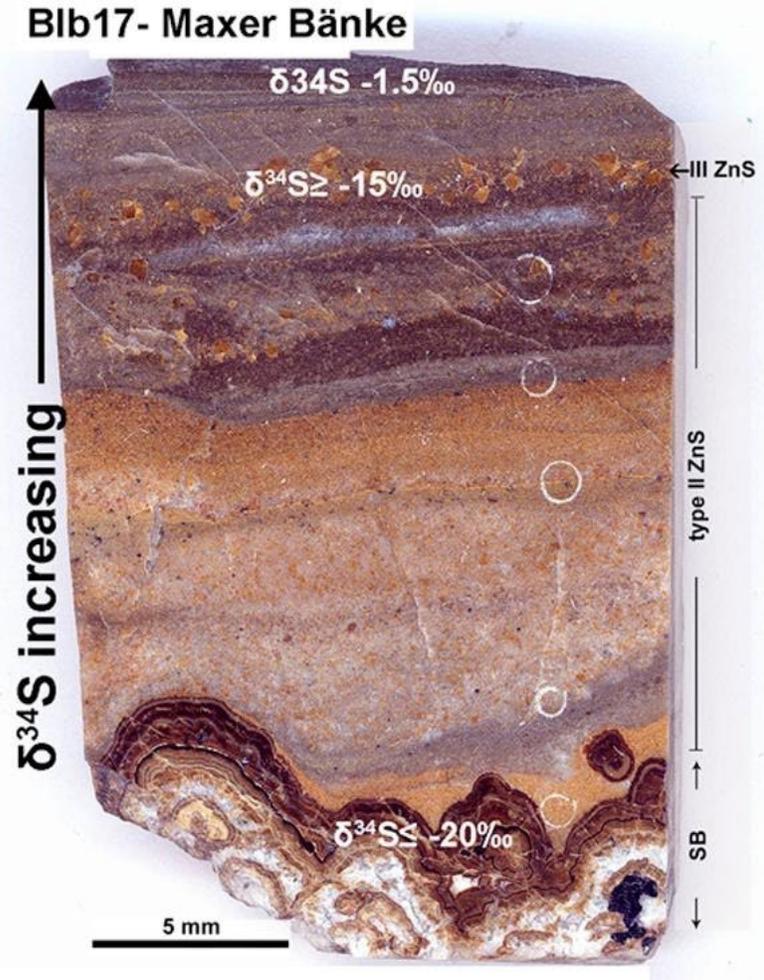
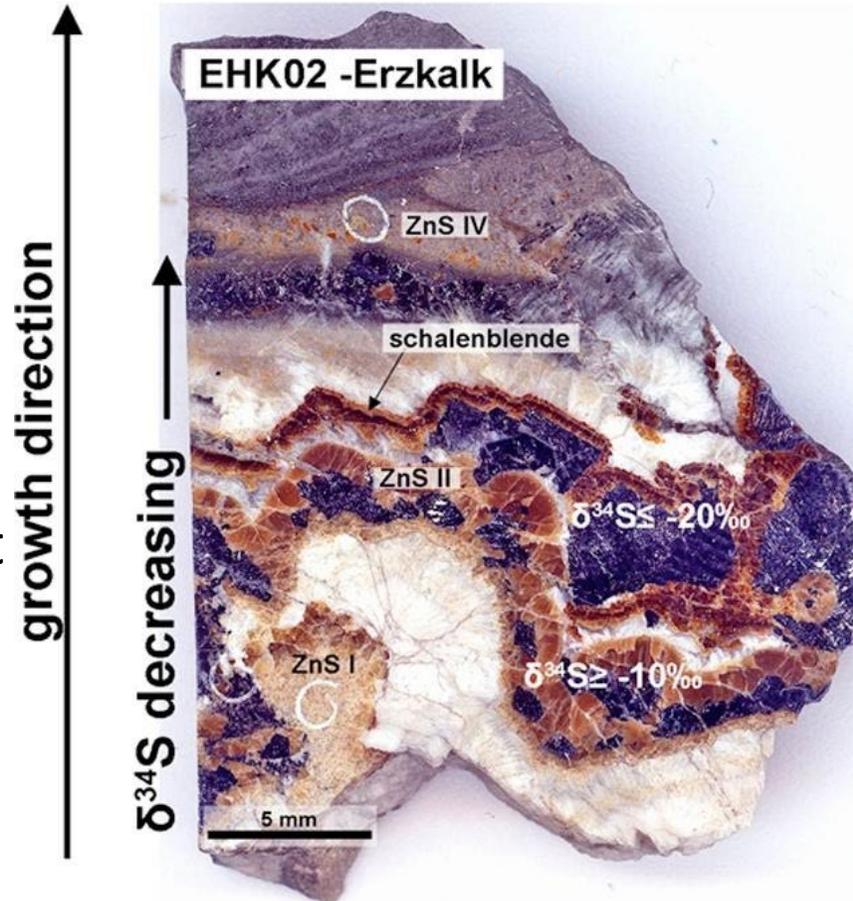


Analyses des textures des corps minéralisés

Caractéristiques intrinsèques texturales de la minéralisation

- Textures litées:

- Sédiments internes chimiques et / ou détritiques
- Figures de sédimentation : slump, granoclasement



Bleiberg Pb-Zn Alpes Autrichienne

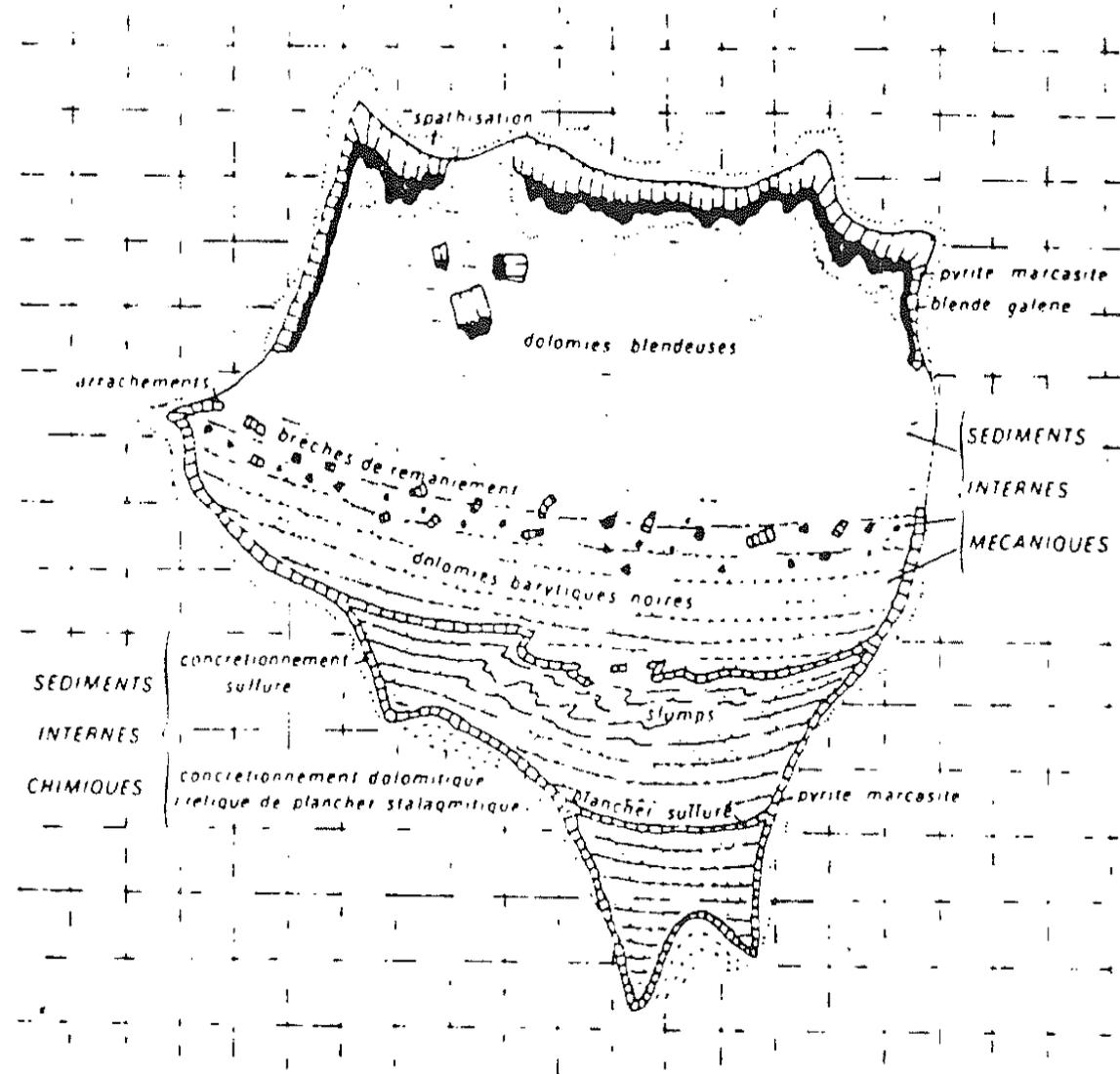


Fig. 64 Schéma synthétique illustrant les modalités de remplissage d'une cavité karstique idéale

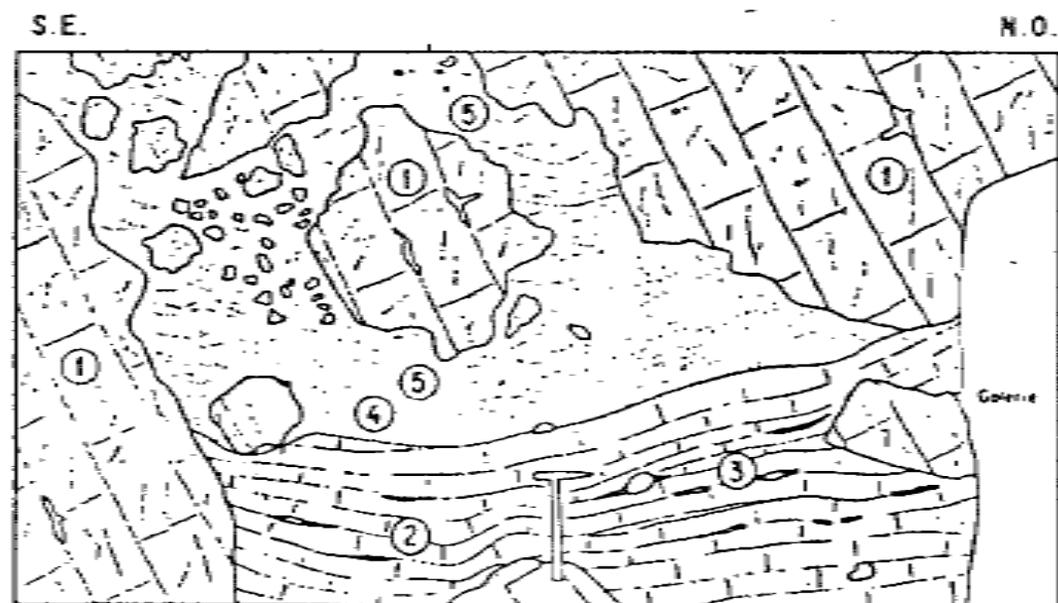
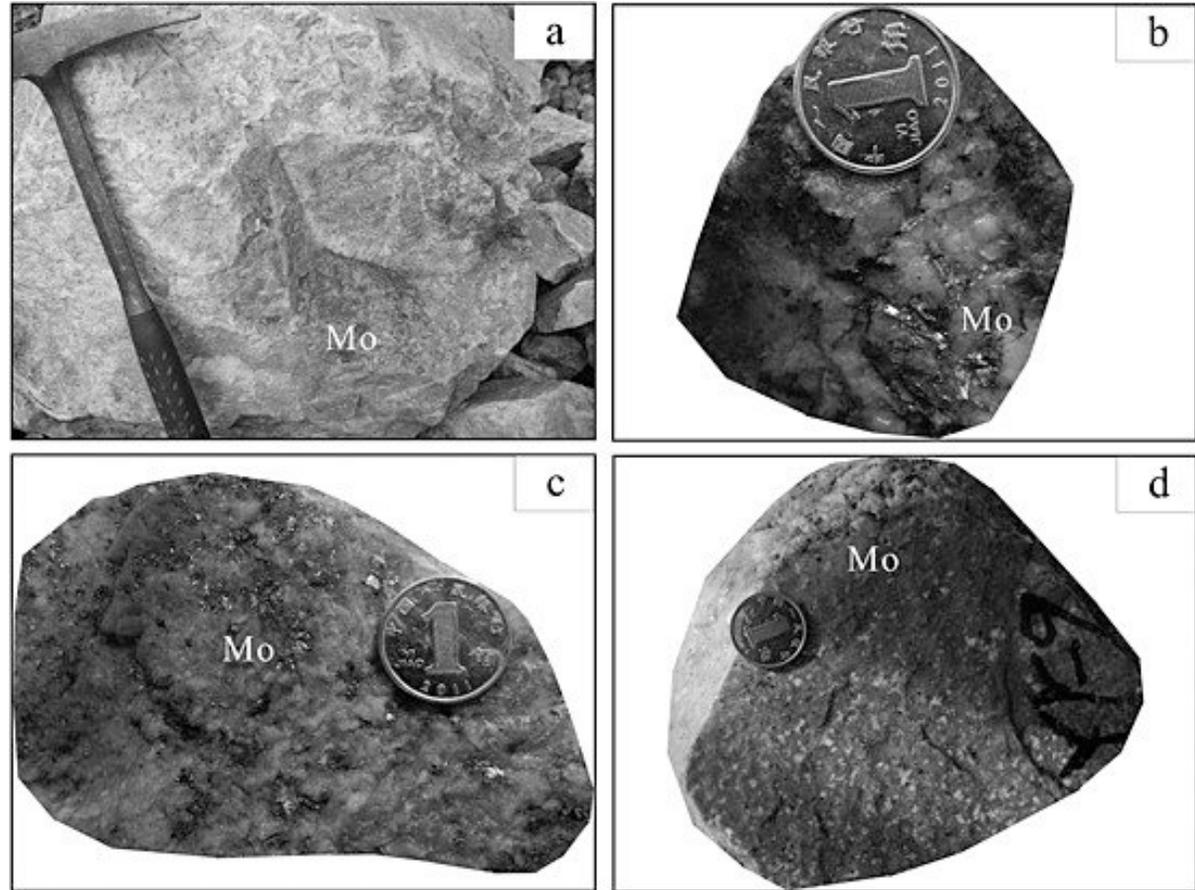


FIG. 4. — Chantler Tabusse. Niveau 425. Schéma de parement. Cavité karstique à remplissage dolomitique sombre stratifié et minéralisé, dans la dolomite géorgienne.

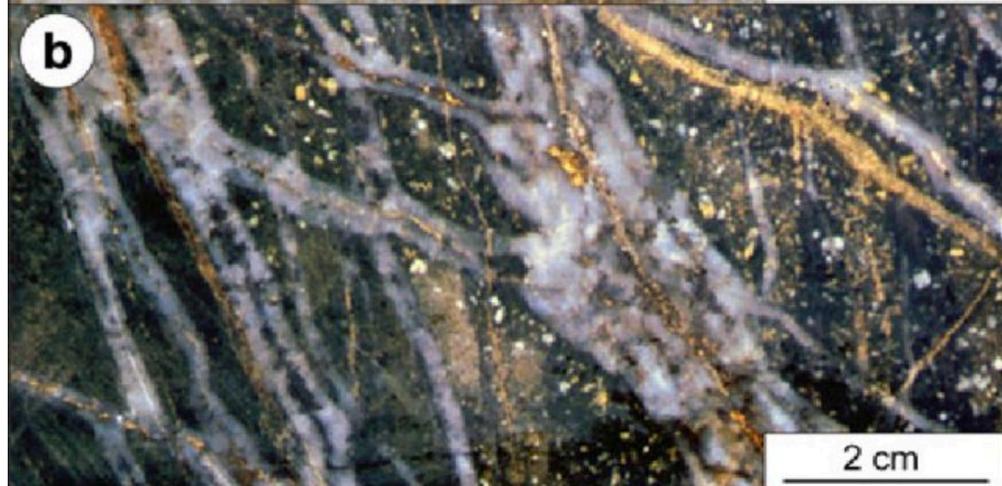
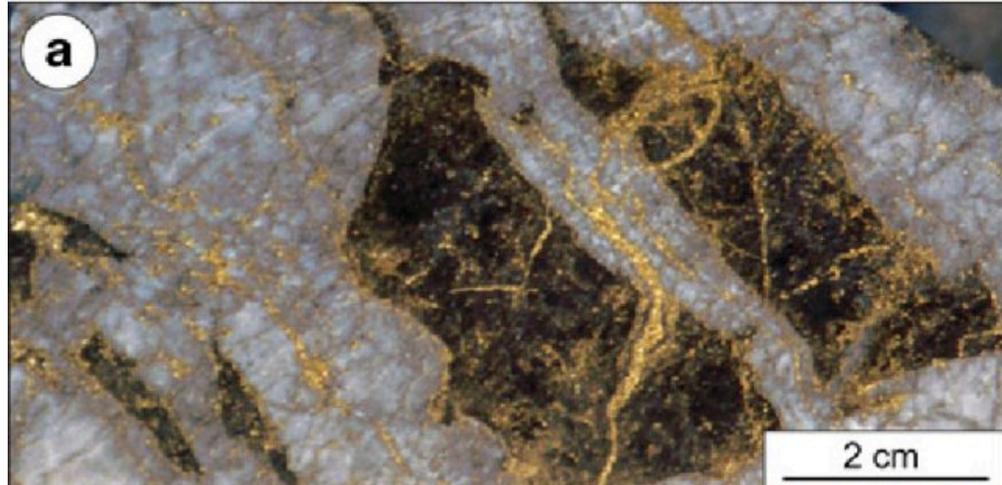
① : Dolomie gris-beige du Cambrien ; ② : remplissage lité intra-karstique ; ③ : Blende rouge litée et blocs de dolomie des épontes ; ④ : Barytine litée à nombreuses imprégnations de matière organique ; ⑤ : Barytine lamellaire.

- Disséminée



Molybdénite disséminée dans du quartz Yinyan
« porphyre cuprifère crétacée »

- Fissurale
- Stockwerk (et stockwerk réglé)

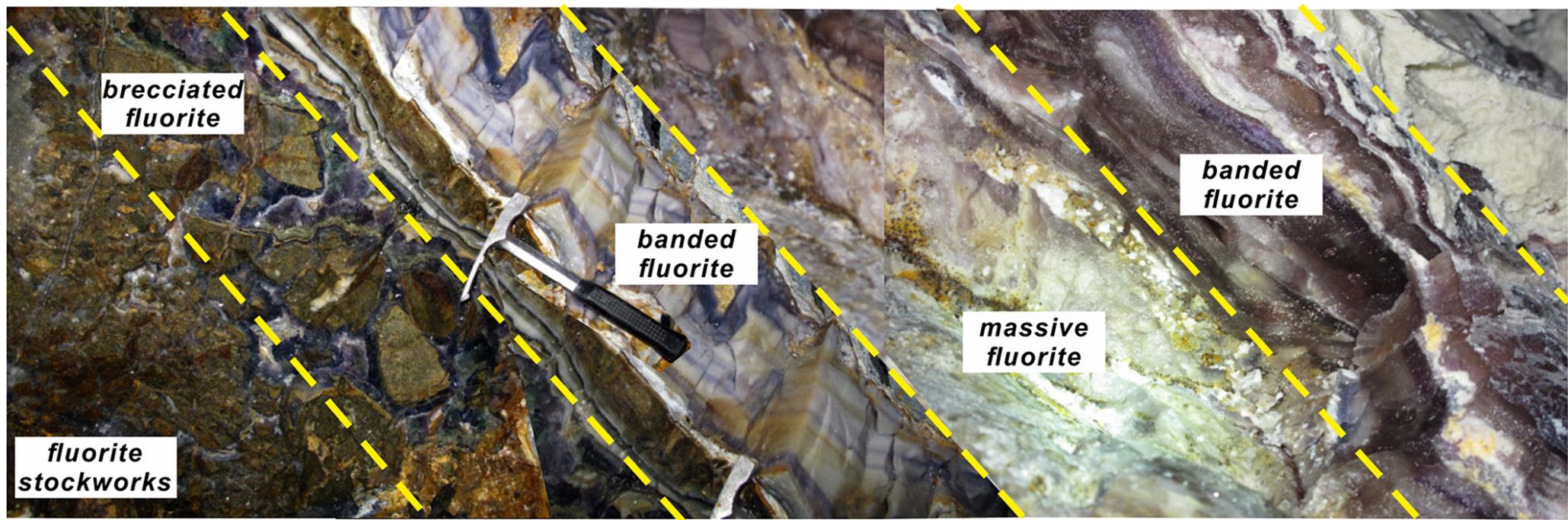
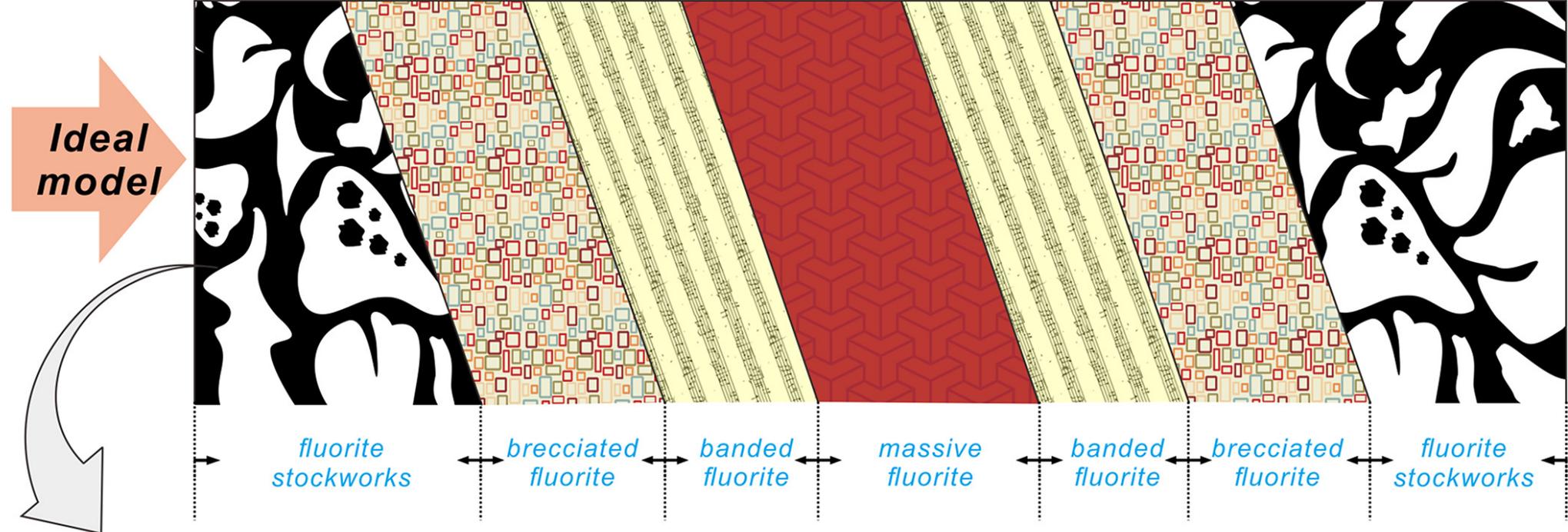


Porphyre cuprifère , Mongolie

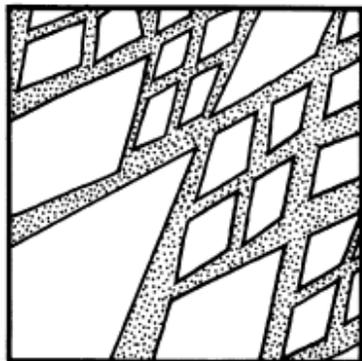
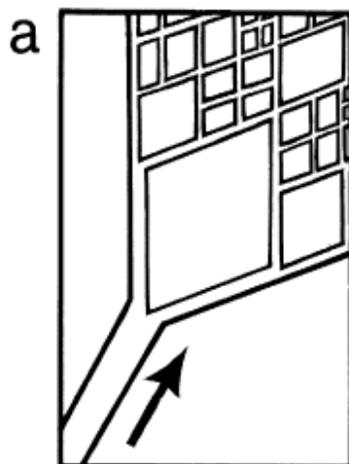


El Teniente Chili (Diatrème / porphyre cuprifère)

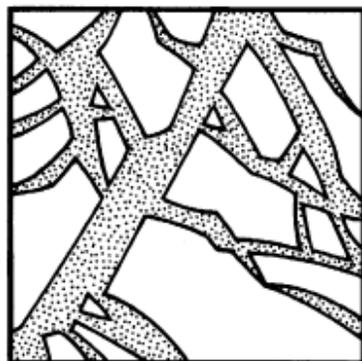
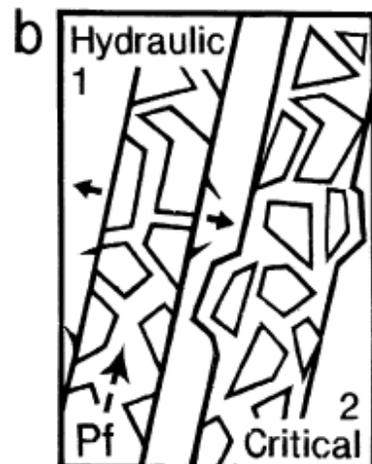
- Rubanée (géodique)
- Brèche et brèche cocarde



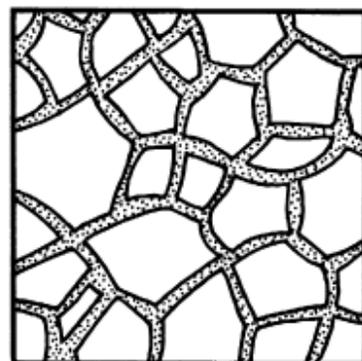
Brèches



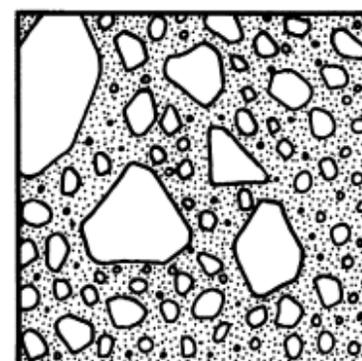
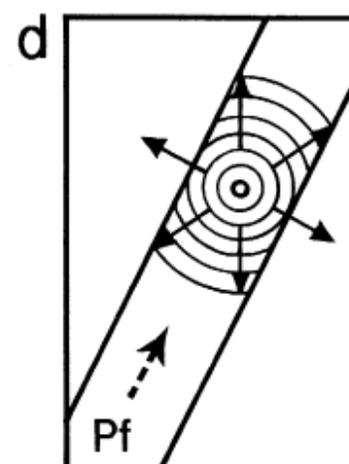
TECTONIC
COMMINUTION



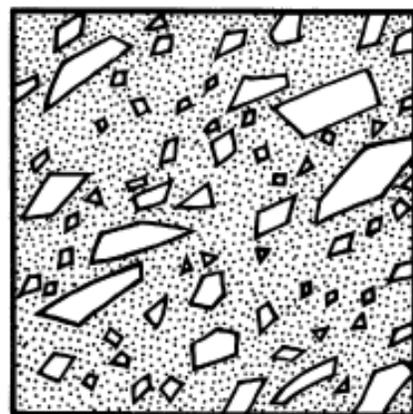
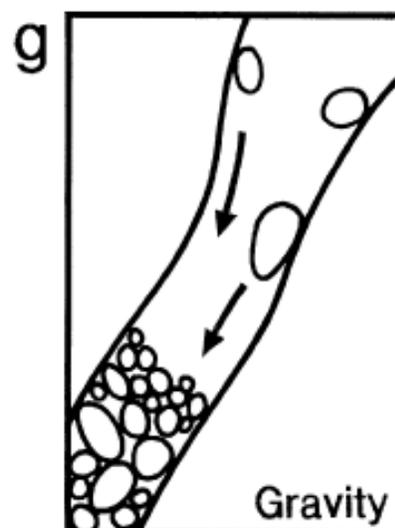
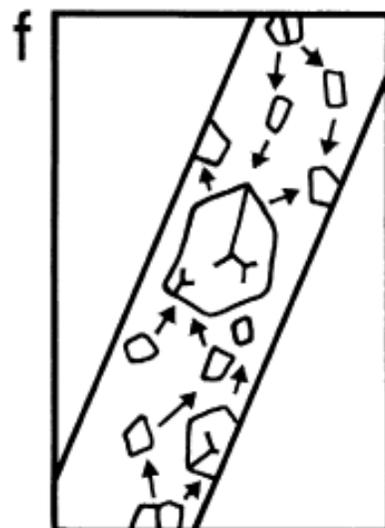
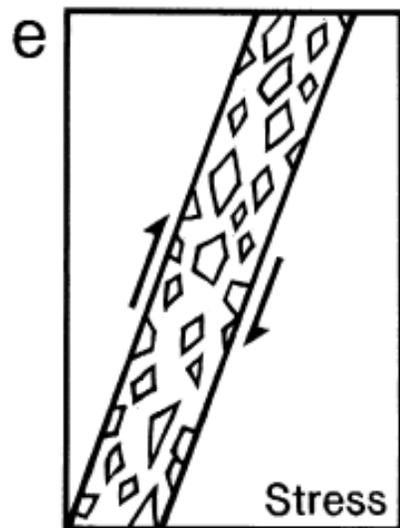
FLUID-ASSISTED
BRECCIATION



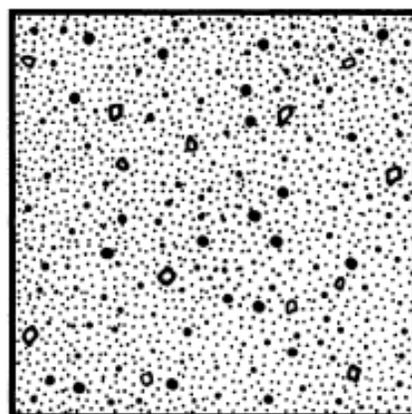
VOLUME
REDUCTION



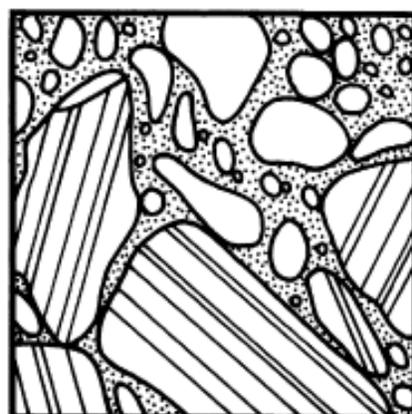
VOLUME
EXPANSION



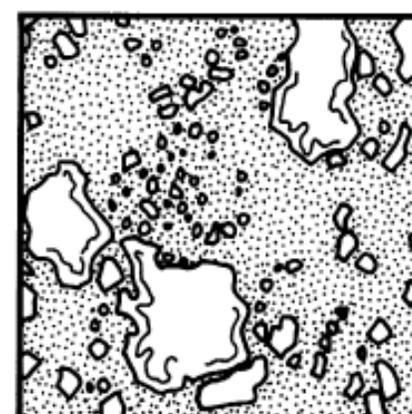
**WEAR-
ABRASION**



IMPACT



COLLAPSE



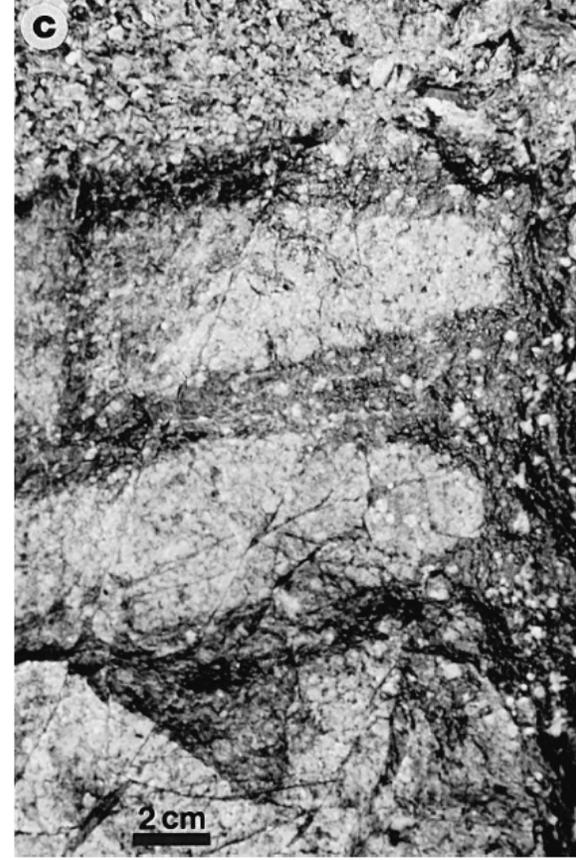
**CORROSIVE
WEAR**



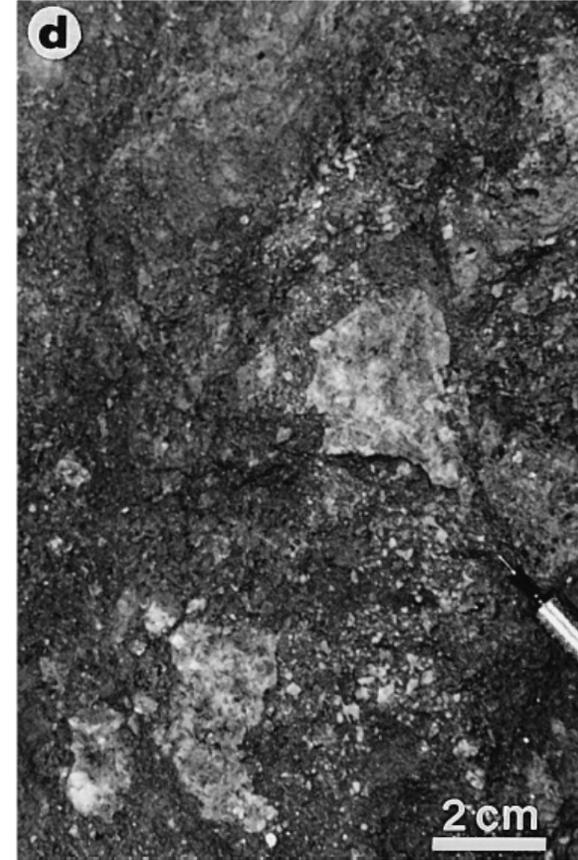
Brèche hydraulique,
gisement d'or Abitibi



Brèche d'effondrement
Djebel Aouam Pb, Zn Ag



Corrosion (par diffusion),
Don Rouyn Cu-au



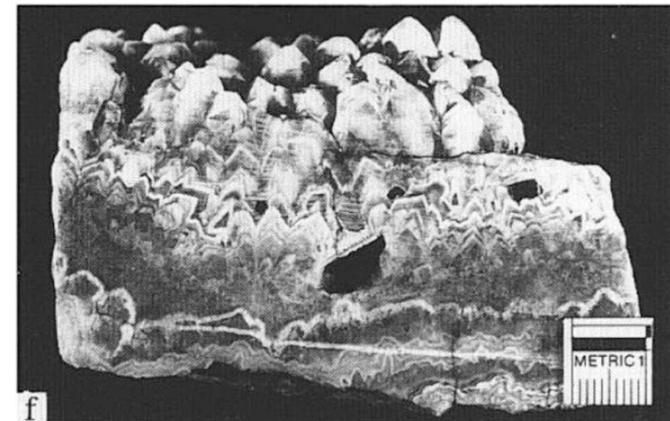
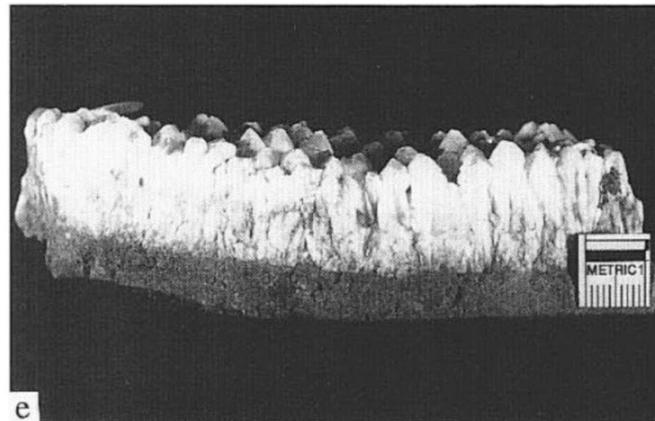
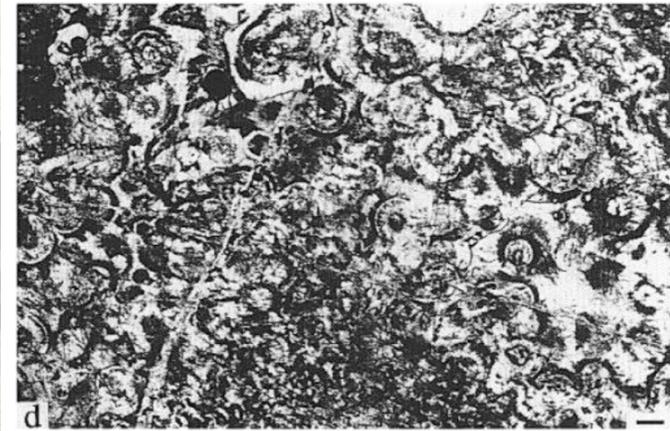
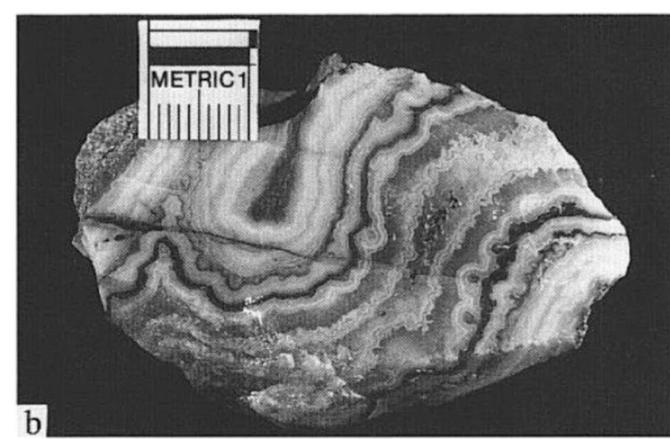
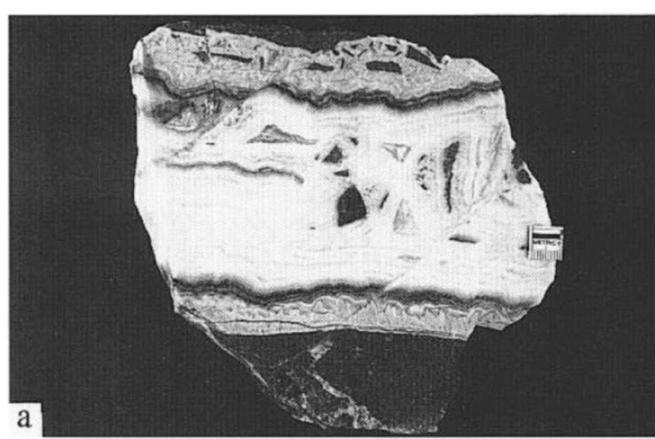
Corrosion (cinétique)
Olympic dam (U_Cu_Au)

Table 1
Geological and physical processes of brecciation in hydrothermal vein-type deposits

Process	Stress	Origin	Geology	Other names	Examples	References
Tectonic comminution	renewable	uniform and non-uniform stresses (tensile or compressive)	comminution in brittle fault zones	fault breccia, break up	St. Salvy (Zn, France), J. Aouam (Pb, Ag, Morocco)	Cassard et al., 1994; Jébrak, 1984a
Fluid-assisted brecciation (hydraulic)	pulse	uniform stress (mainly tensile)	almost every type of deposit	crackle break up	El Hammam (F, Morocco), Dreislar (Ba, Germany), Creede (Ag, Au, Colorado)	Jébrak, 1984b
Fluid-assisted brecciation (critic)	pulse	uniform stress (tensile)	lode gold deposit	implosive, spalling, break up	Silidor (Au, Québec), Victoria (Au, W, Australia)	Carrier and Jébrak, 1994; Forde and Bell, 1994
Wear abrasion	renewable	uniform to non-uniform stress (compressive)	shear zone	milled, break up	Silidor (Au, Québec)	Colvine et al., 1988; Carrier and Jébrak, 1994
Volume reduction	non-renewable	uniform stress (tensile)	mud cracks, cooling of silica sinter	break up, desiccation, thermal contraction,	Cirotan (Au, Java), McLaughlin (Au, California)	Jébrak et al., 1996
Volume expansion	non-renewable	Herzian stress	porphyry copper, diatreme	milled, explosive, decompressive, push up	porphyry deposits (Cu, Mexico), Waiotapu (Au, NZ)	Clark, 1990; Hedenquist and Henley, 1985
Impact	non-renewable	Herzian stress	collapse breccias, erosive wear	push up, fall down	Maine (F, France), Silidor (Au, Québec), Les Farges (Pb, Ba, France)	Carrier and Jébrak, 1994; Jébrak, 1984b
Corrosive wear	pulse	disequilibrium	high fluid-rock interactions	milled, pseudo-breccias, break up	Olympic Dam (Cu, U, Au, Australia)	Reeve et al., 1990; Lei et al., 1995

Remplissage des vides

- Les vides :
 - Géodes (poches), fissures, espaces entre les fragments de brèches.
- Croissance libre dans les vides:
 - Textures rubanées montrant des bandes de croissances,
 - Brèches cocardes,
 - Quartz en peigne.



Agrégats subparallèles et croissance radiaire

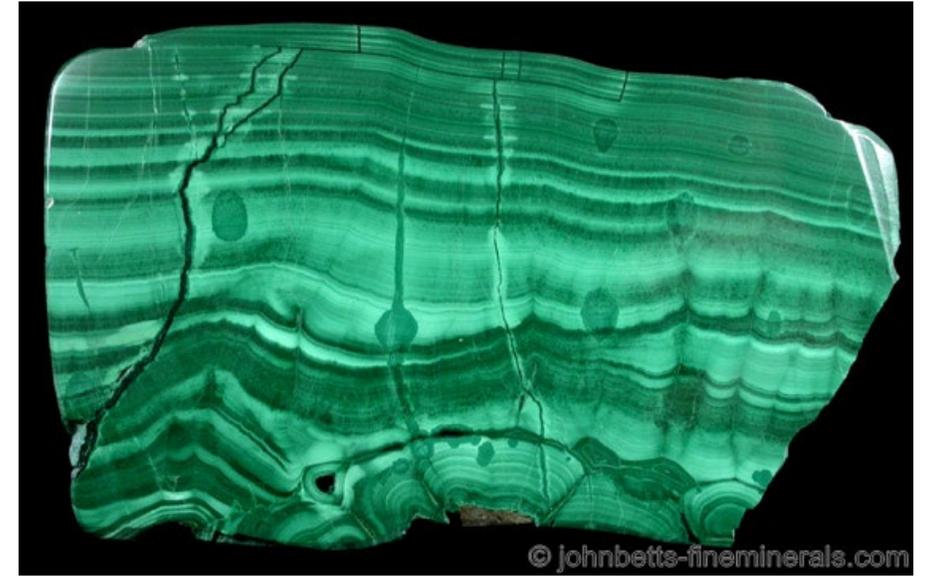
- Croissance libre de cristaux
 - Aciculaire
 - Columnaire (en colonne)
 - Prismatique



- Les cristaux ont pu se former à partir de gels colloïdaux

Le gel est un milieu homogène avec des particules d'échelle nanométriques à micrométriques dispersées dans un milieu suspensif (force de gravitation < aux forces d'agitation thermique)

Ces agrégats ont un texture radiaire formant des botryoïdes (= texture **collomorphe**) et sont probablement les figures formées par des gels initiaux.



- Influence de la vitesse de cristallisation des différents axes:

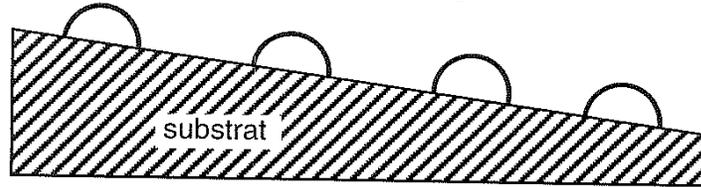
Les nucléus qui ont une orientation de leur axe rapide perpendiculaire à la surface de nucléation sont favorisés et donnent:

- des structure colloïdales rubanées,
- des brèches cocardes et
- des quartz en peigne.

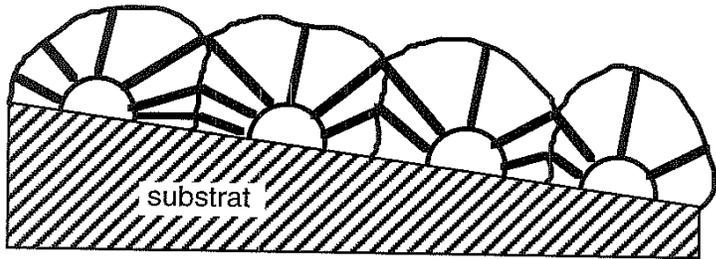


Sens de croissance

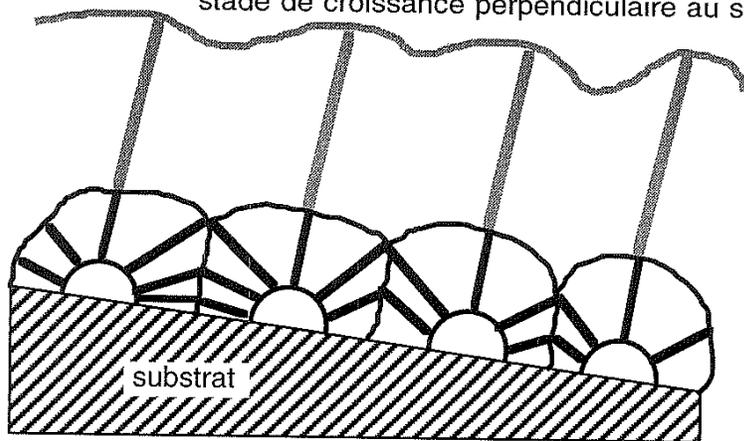
stade de germination



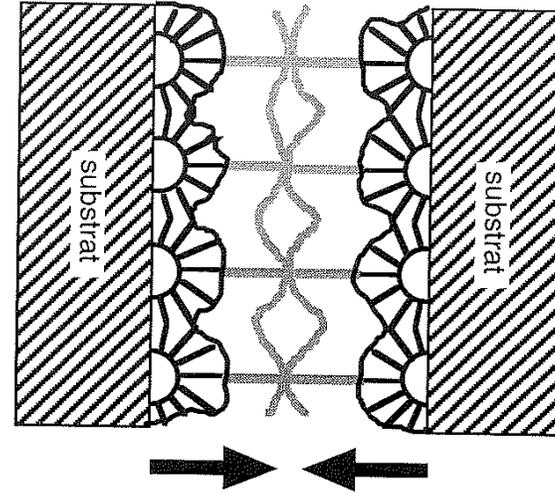
stade de croissance isotrope



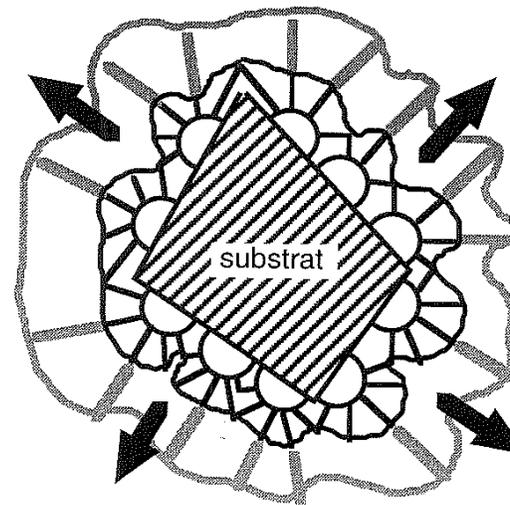
stade de croissance perpendiculaire au substrat



Croissance centripète

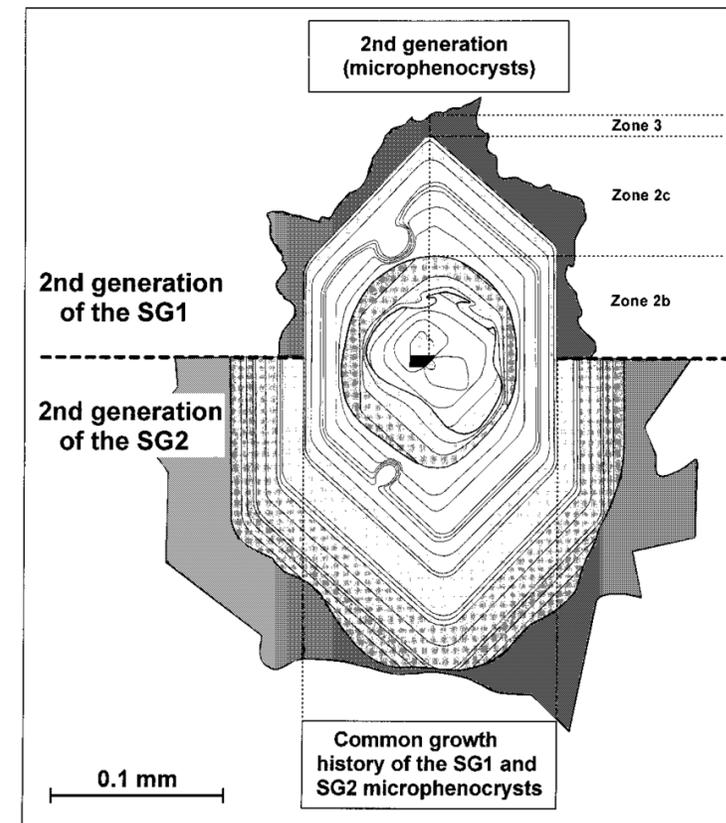


Croissance centrifuge



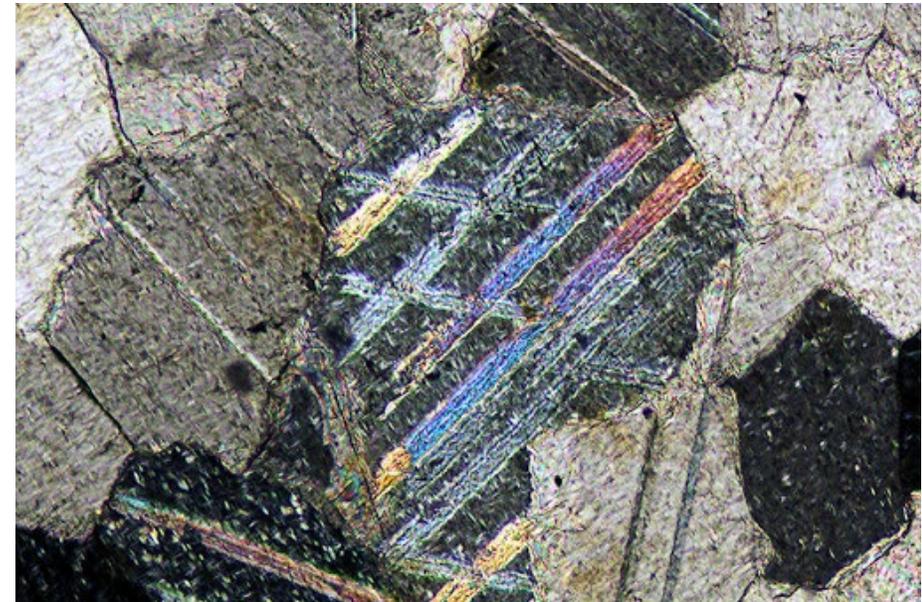
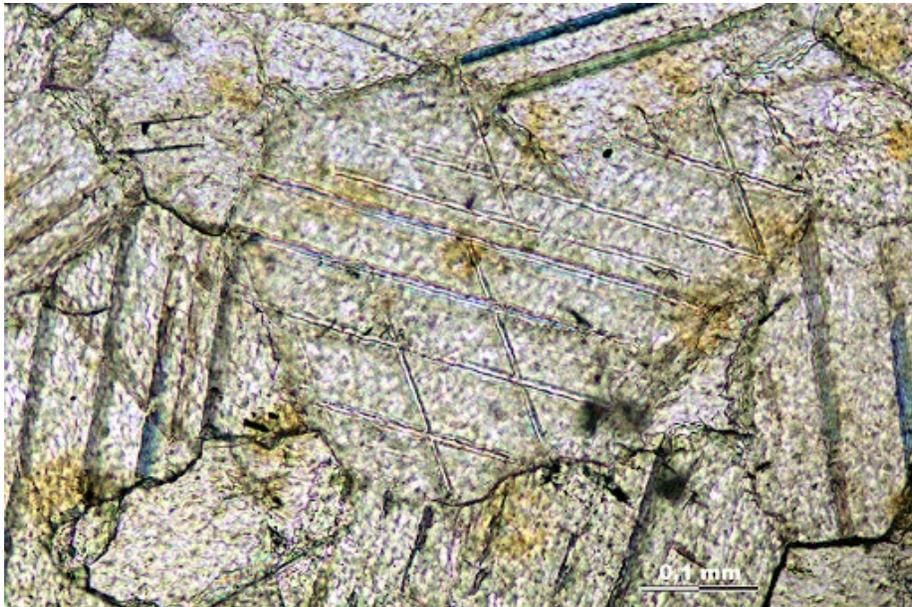
Textures liées au cristal

- Les zonations (détruites par la diffusion intracristalline lors d'une augmentation de température).
- Murissement d'Ostwald: Evolution de la distribution des tailles de particules, minimum d'énergie
 - Disparition des petits grains.
 - Augmentation de la taille des grains.



- Les macles

- Macle de croissance: croissance simultanée de deux cristaux de la même espèce en position de macle par contact (Albite), interpénétration (Chalcopyrite, Stanite).
- Macle de transformation polymorphique: un cristal A se transforme en une mosaïque cohérente de cristaux de phase B
- Macle mécaniques (lamelles). Les chocs, les contraintes anisotropes peuvent déformer le réseau (calcite, pyrrhotite).



Silica and Calcite Mineral Textures



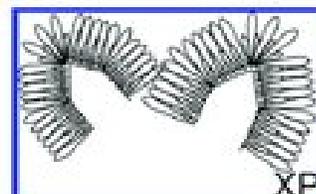
A) Jigsaw



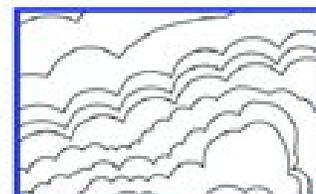
B) Feathery



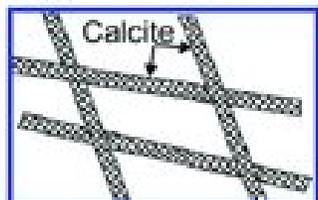
C) Flamboyant



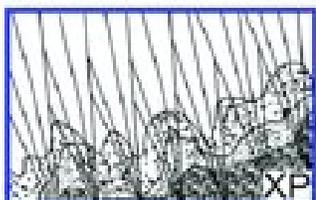
D) Plumose quartz



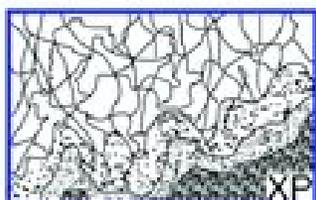
E) Colloform



F) Lattice bladed calcite



G) Colloform-banded plumose



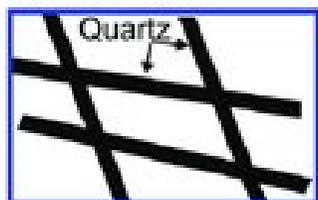
H) Colloform-banded jigsaw



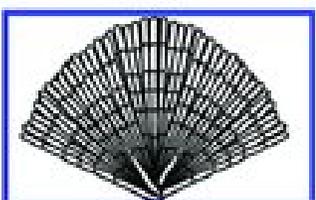
I) Ghost-sphere



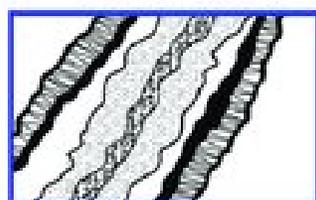
J) Moss



K) Lattice-bladed calcite replaced by quartz

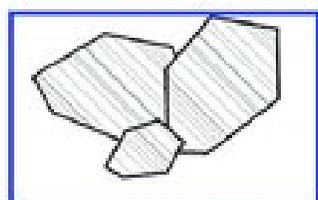


L) Pseudo-acicular quartz

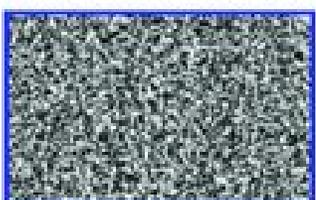


M) Crustiform

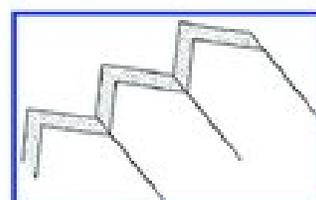
Boiling



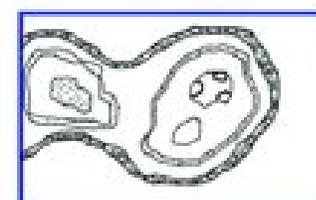
N) Rhombic calcite



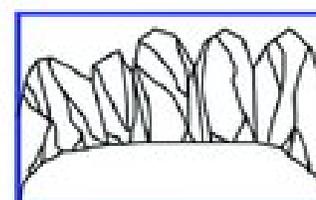
O) Massive



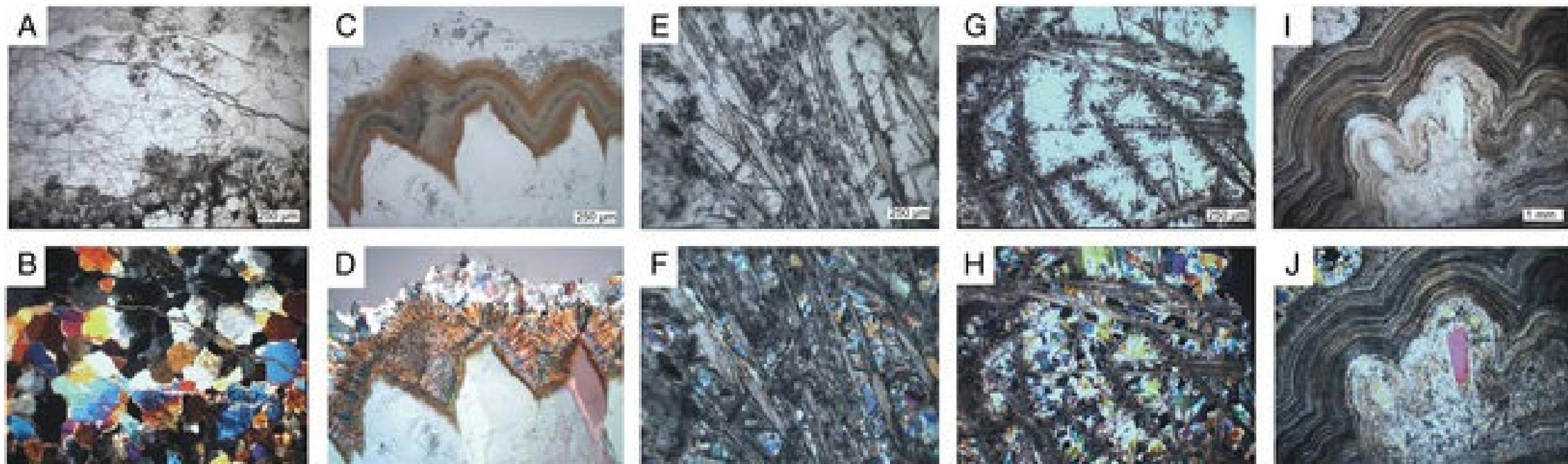
P) Zonal



Q) Cockade



R) Comb
Non boiling

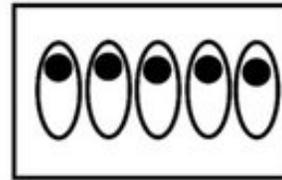


Texture minérale du gisement épithermal Ag Au de Guanajuato, Mexique.

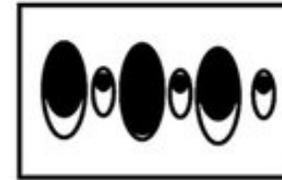
Les inclusions : inclusions fluides et inclusions minérales

- Inclusions fluides.

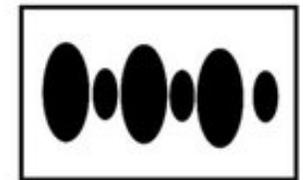
Les fluides sont piégés de façon homogènes à H T° et H P et deviennent multiphasique en conditions ambiantes.



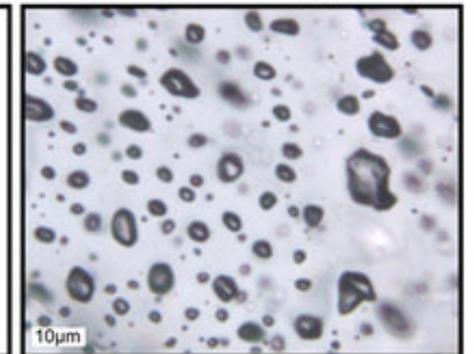
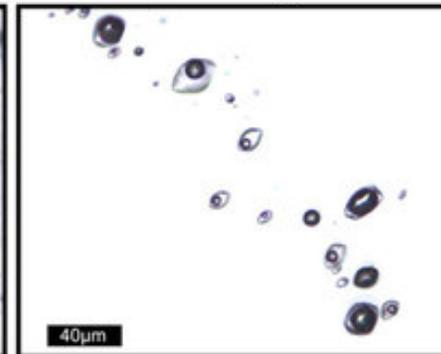
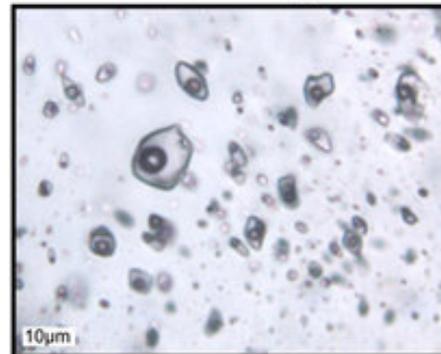
Consistent phase ratios
"non-boiling"



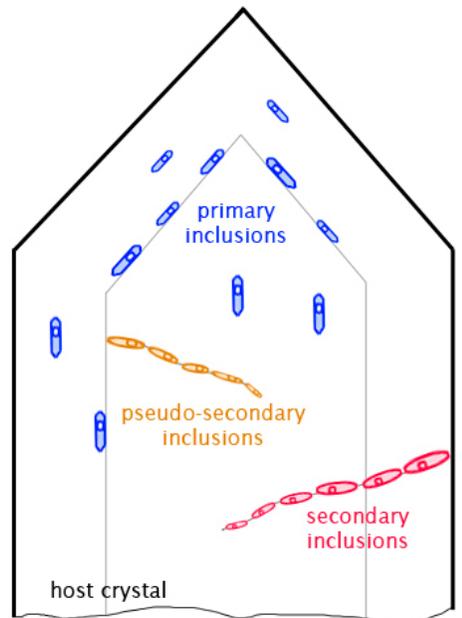
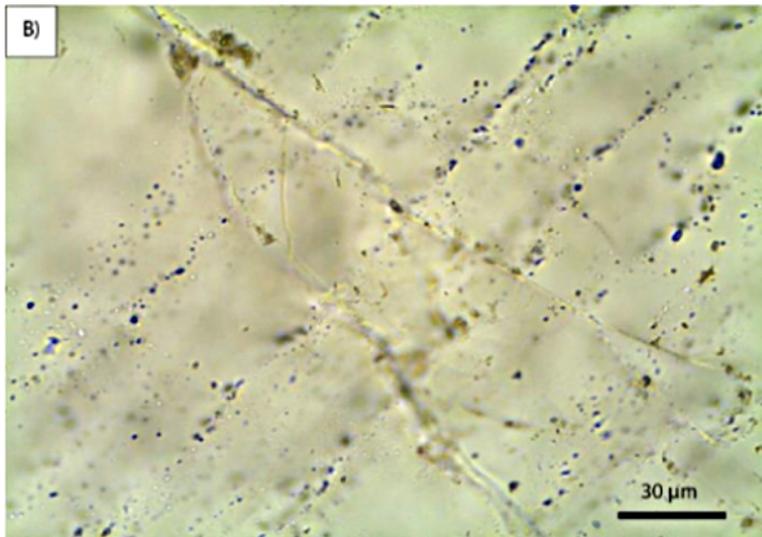
Coexisting liquid-rich and vapor-rich inclusions
"Boiling"



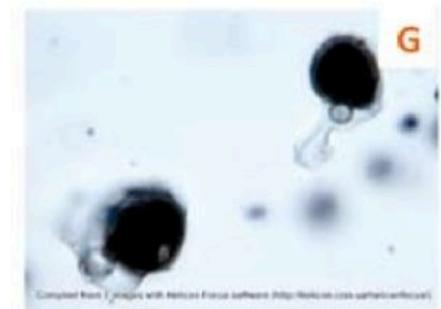
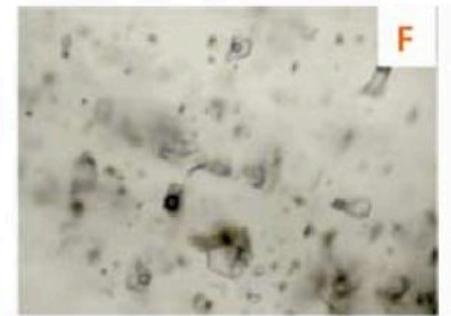
Only vapor-rich inclusions (no liquid-rich)
"Flashing"



On distingue les inclusions primaires et les inclusions secondaires.



gems-inclusions.com



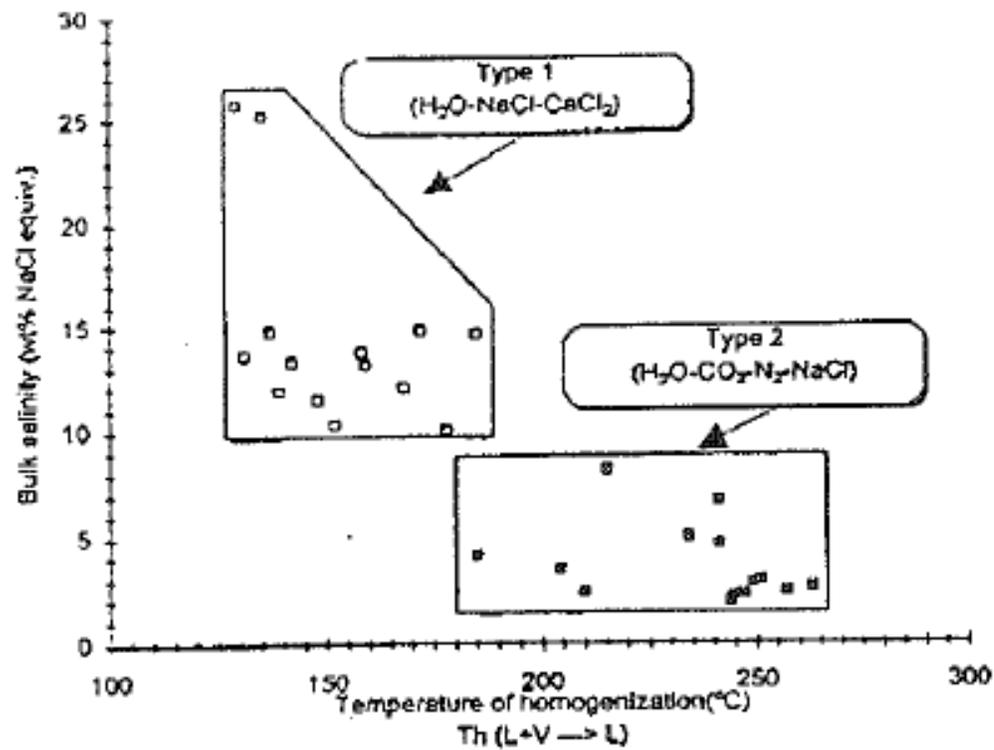


FIG. 3. Plot of homogenization temperatures versus salinities for type 1 (white symbols) and type 2 (black symbols) fluid inclusions.

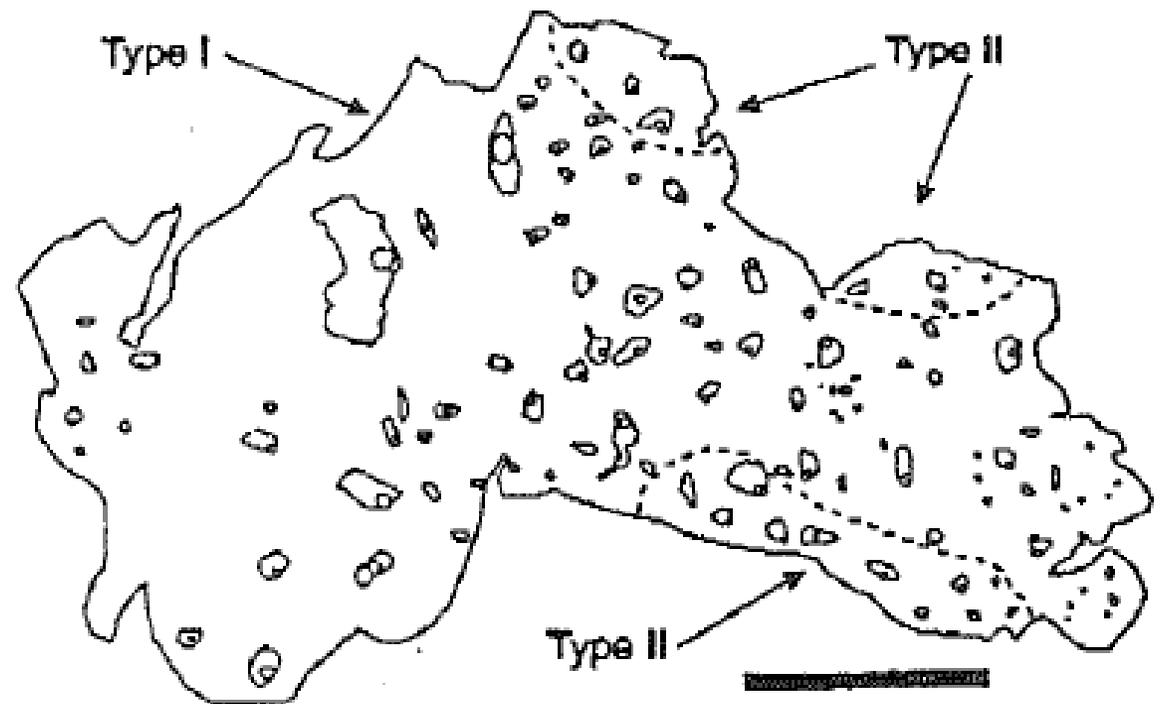


FIG. 4. Drawing of a single zoned, marginally recrystallized shalcrinite showing the distribution of primary inclusions of both type of fluid inclusions. The bar equals 200 μm .

Les inclusions minérales

- Elles ont tendance à développer des formes euhédrales (Automorphes) qui rendent difficile l'évaluation de la chronologie.
- L'histoire d'une inclusion peut être complexe

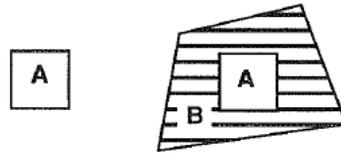


Aégérine dans de une apatite.

A. Hôtes plus vieux (inclusion anté)

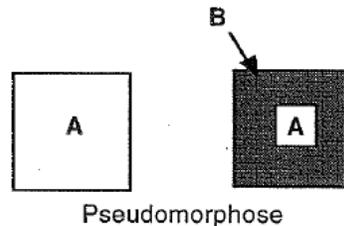
- Inclusions primaires et incorporées (altérations)
 - L'inclusion est liée à une nucléation hétérogène ou autre

(A antérieur à B)



- Reliques liées à un remplacement (pseudomorphose)

(A antérieur à B)



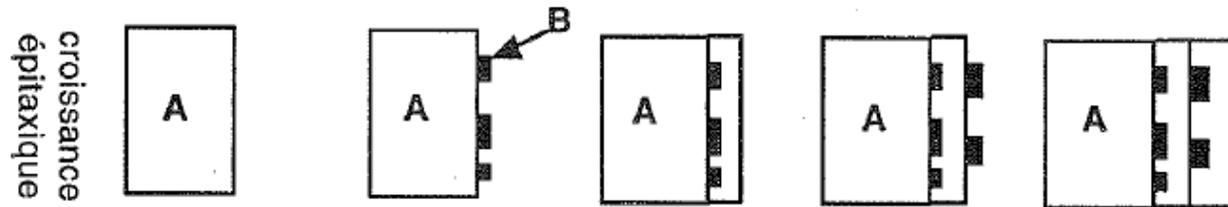
- Inclusion incorporée

- L'inclusion reste après le remplacement de l'hôte, ou A est inchangée et B dissoute et re précipitée en C.

B) Hôtes et inclusions liées (cogénétiques)

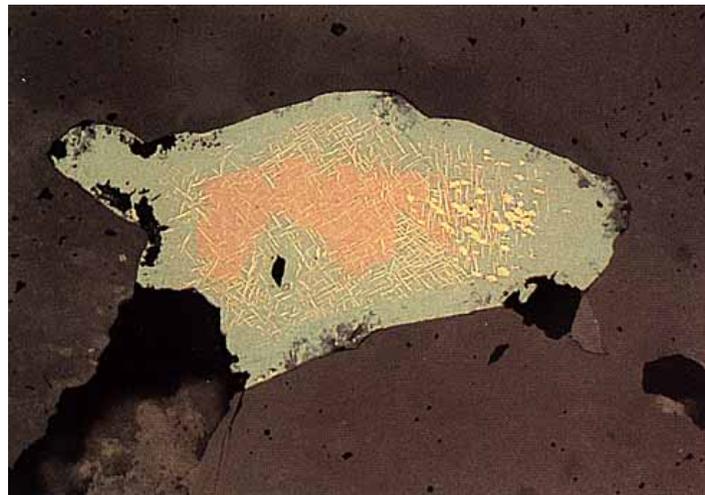
- Les intercroissances (myrmèkites)

- Croissance épitaxiale

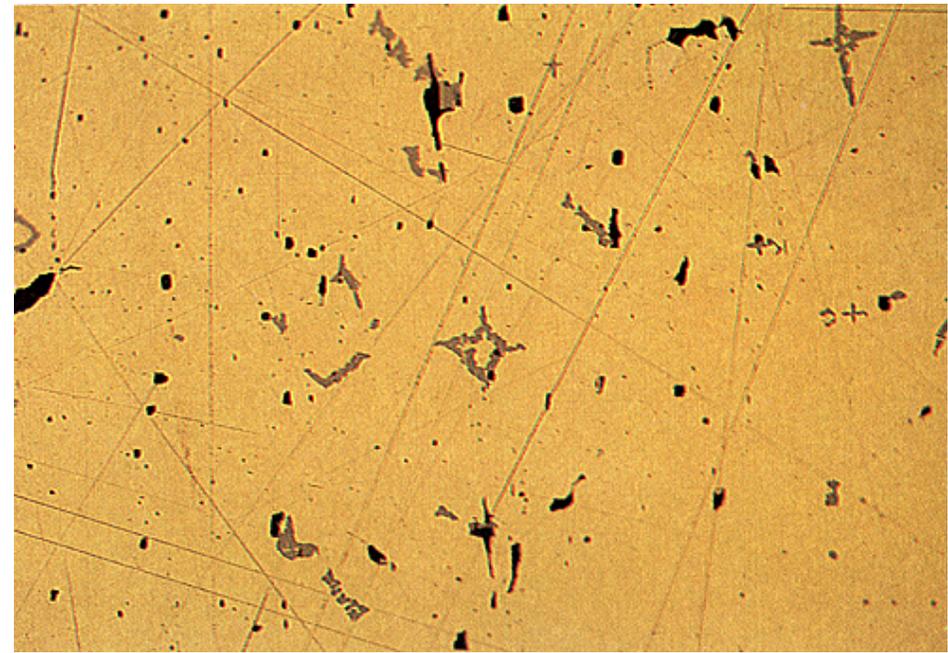


- Les exsolutions

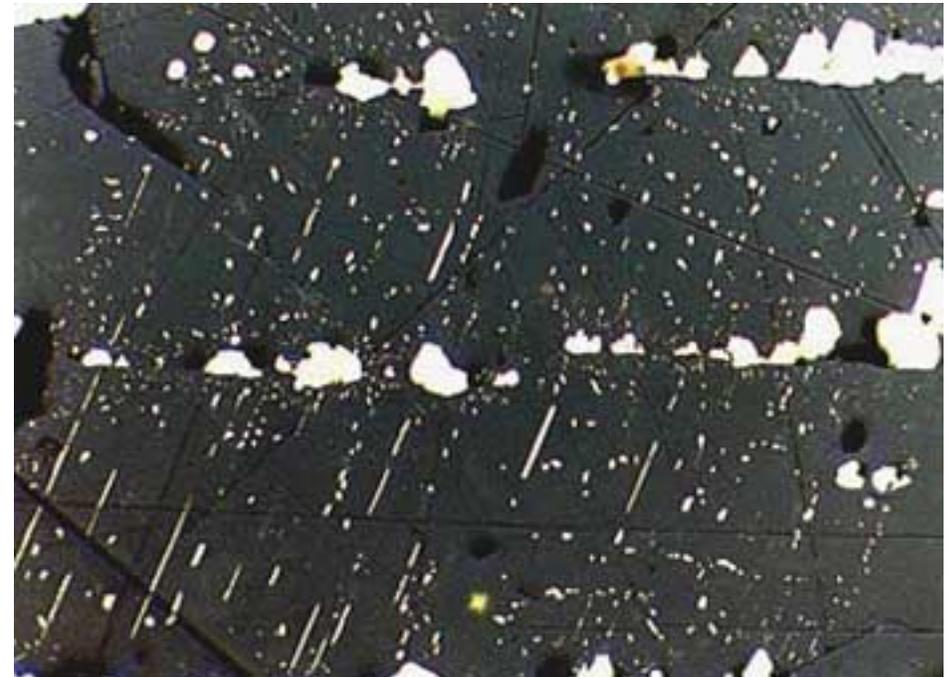
- Bornite / chalcopryrite



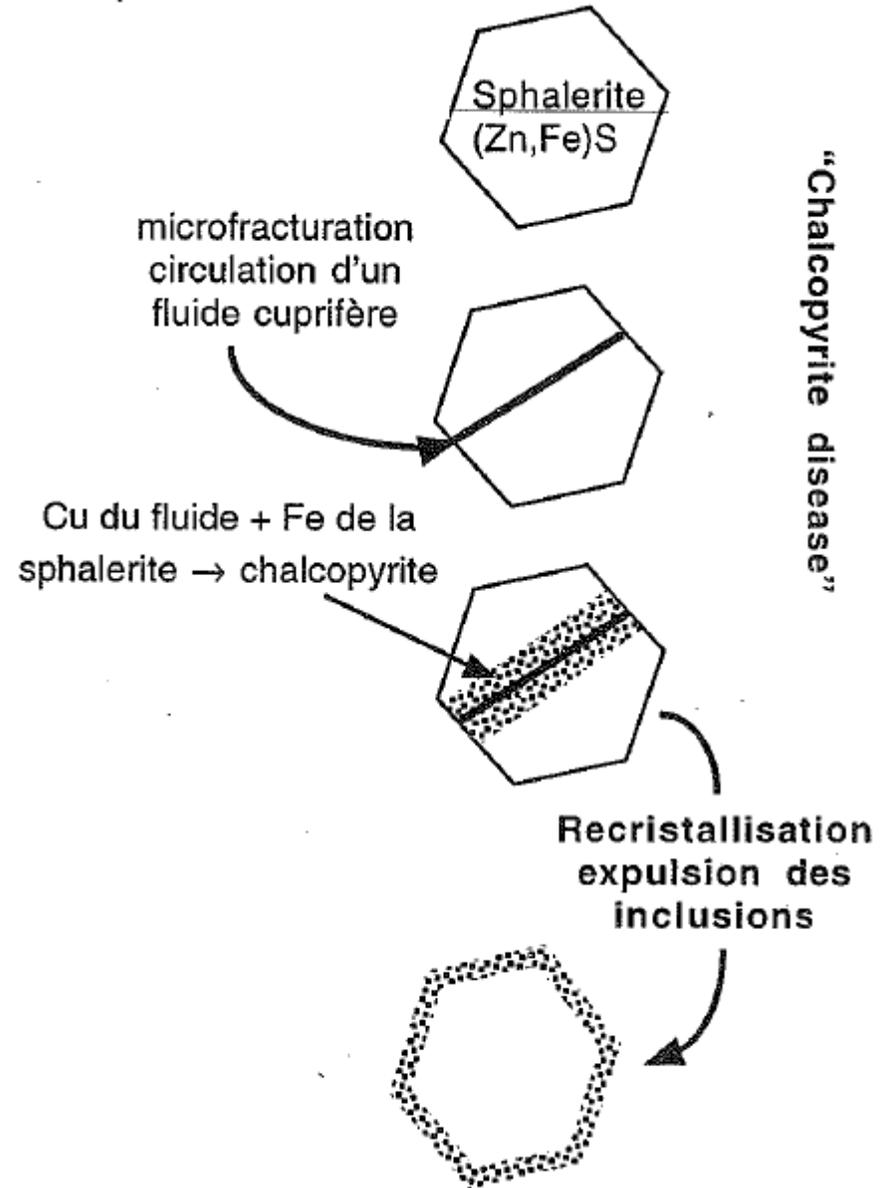
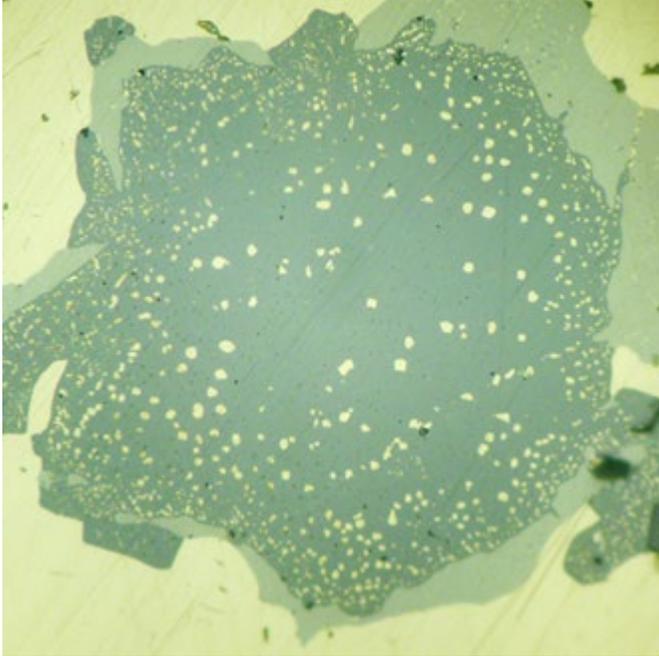
- Inclusion de sphalérite dans la chalcoppyrite



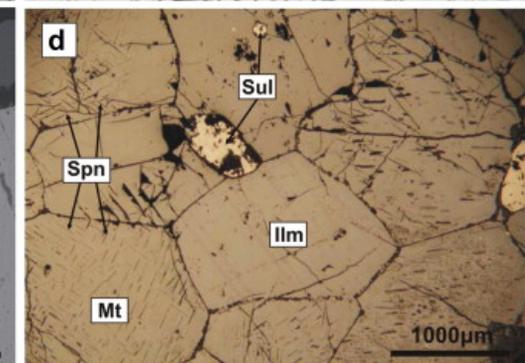
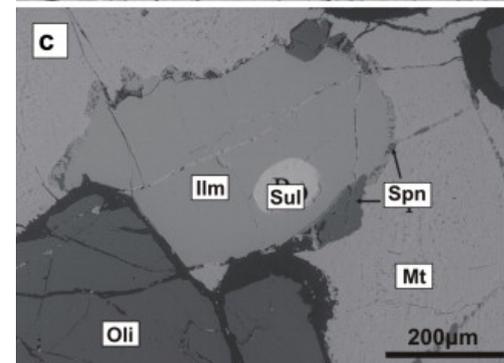
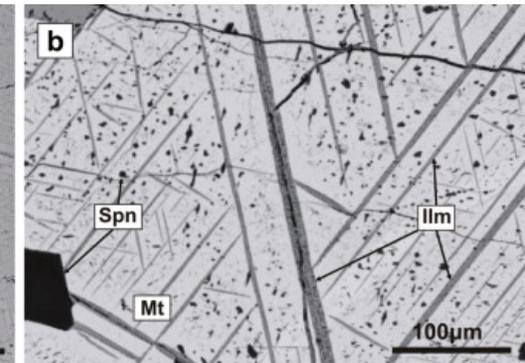
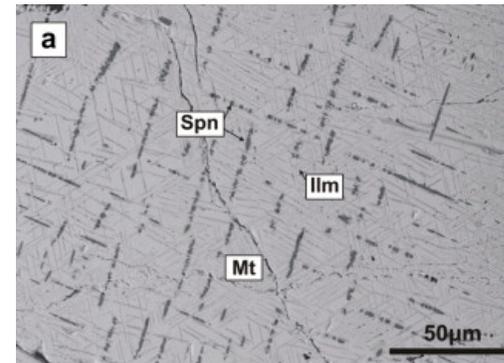
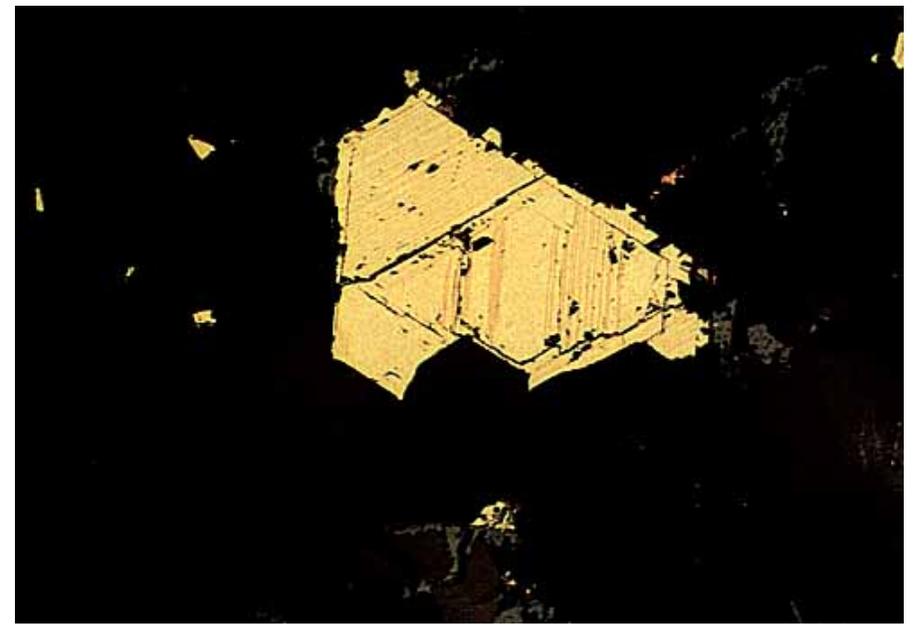
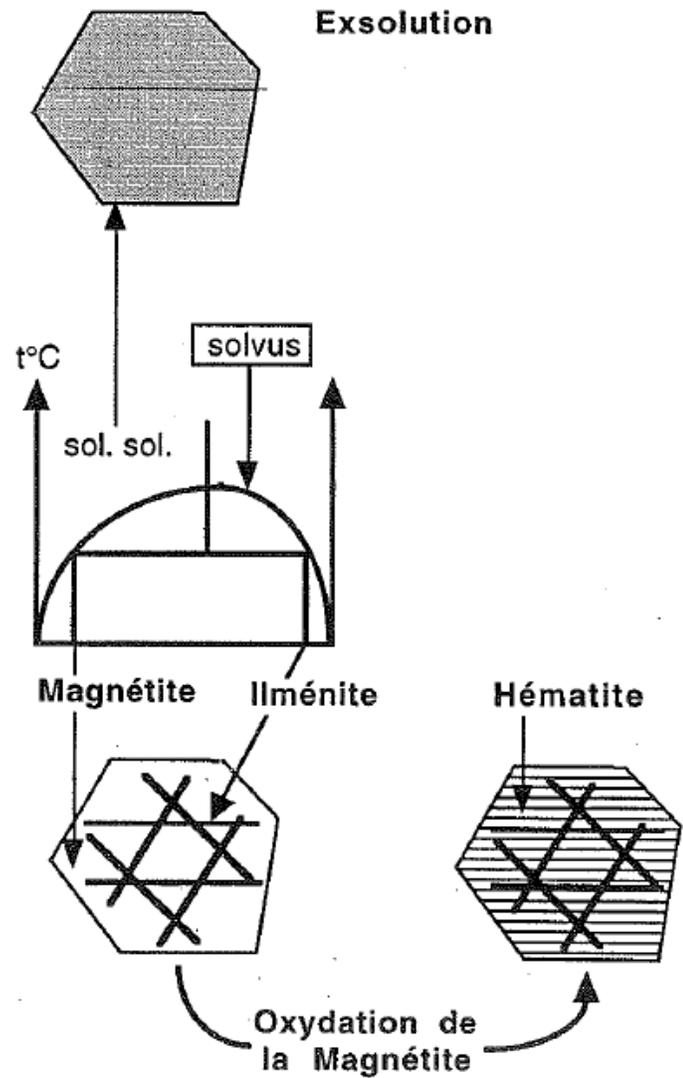
- Inclusions de Chalcopyrite dans la sphalérite



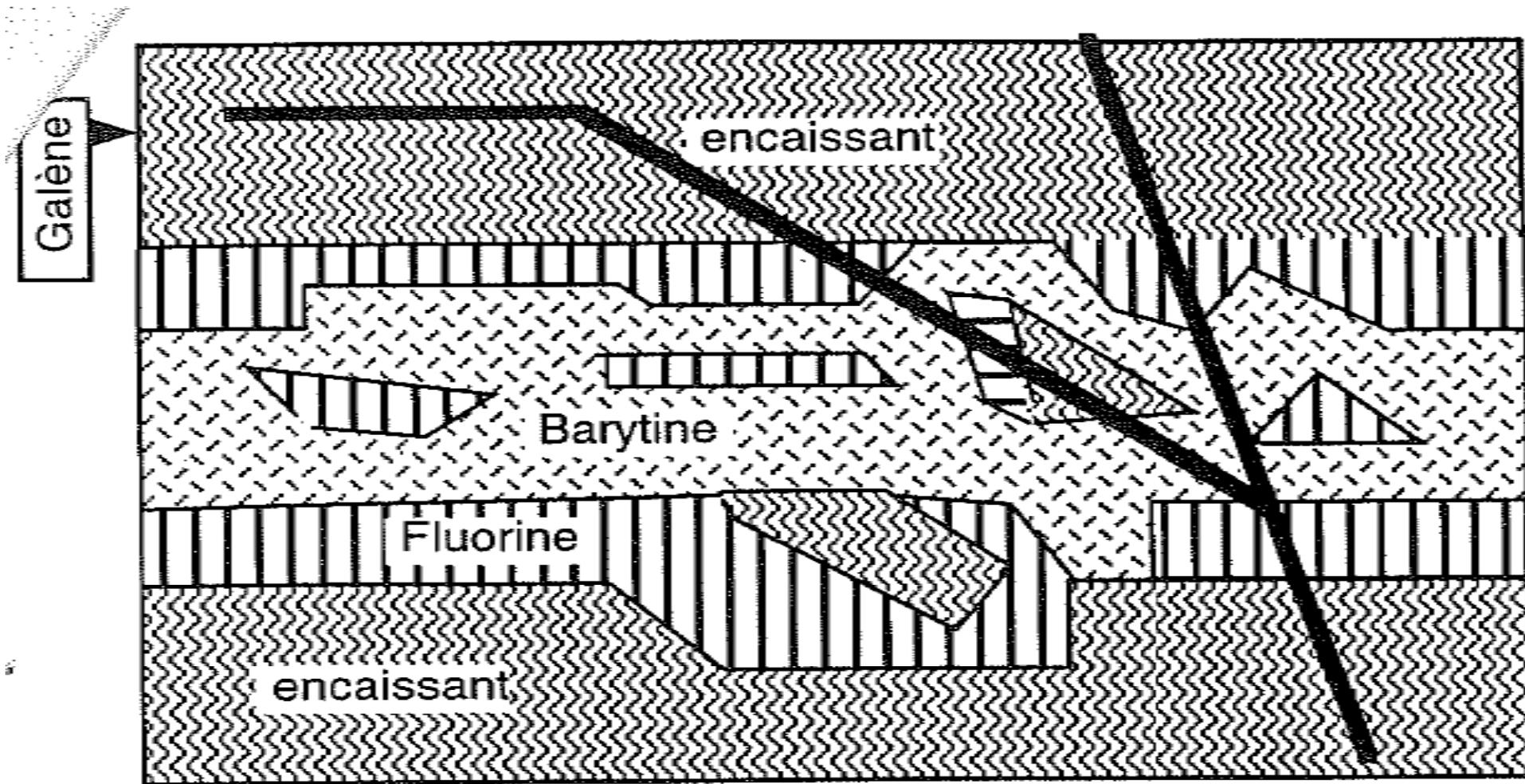
- Chalcopyrite disease

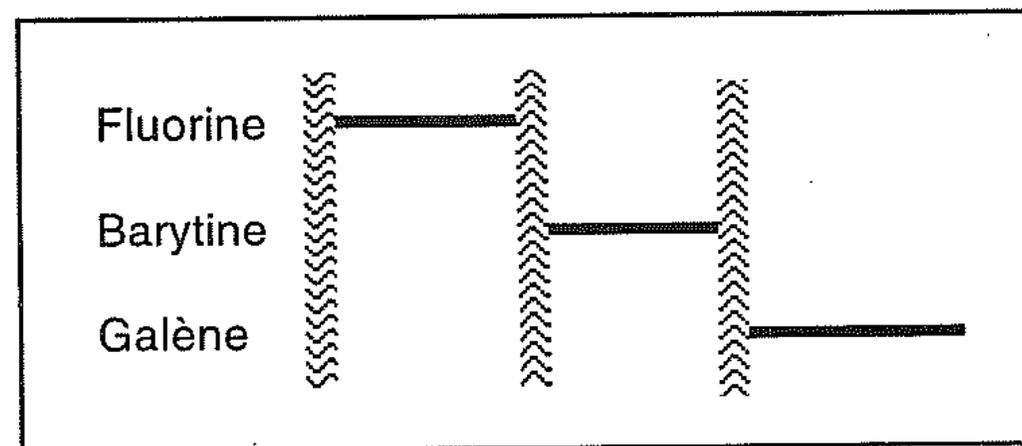
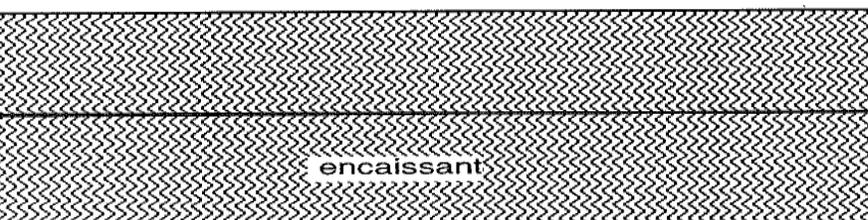
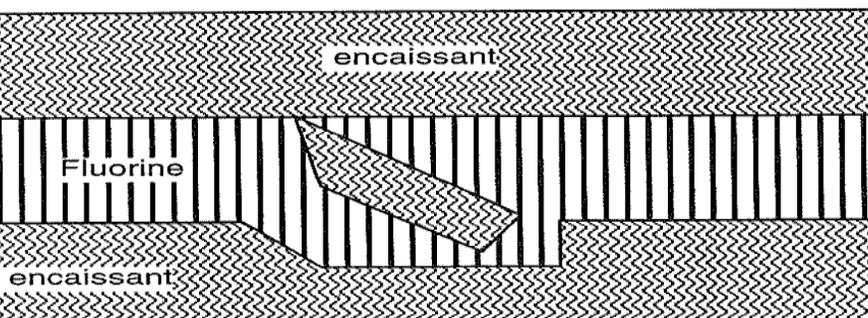
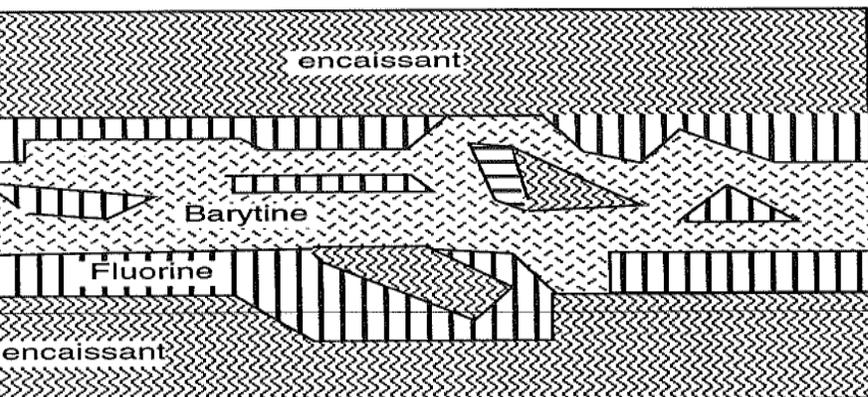
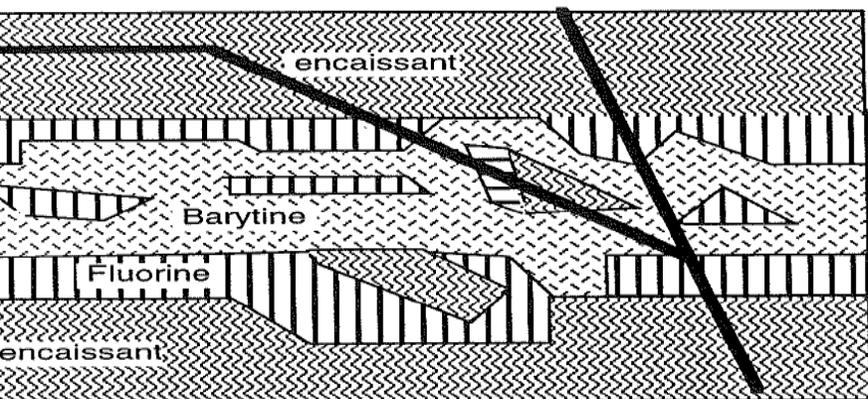


- Exsolution d'ilménites dans la magnétite



Séquence paragenétique





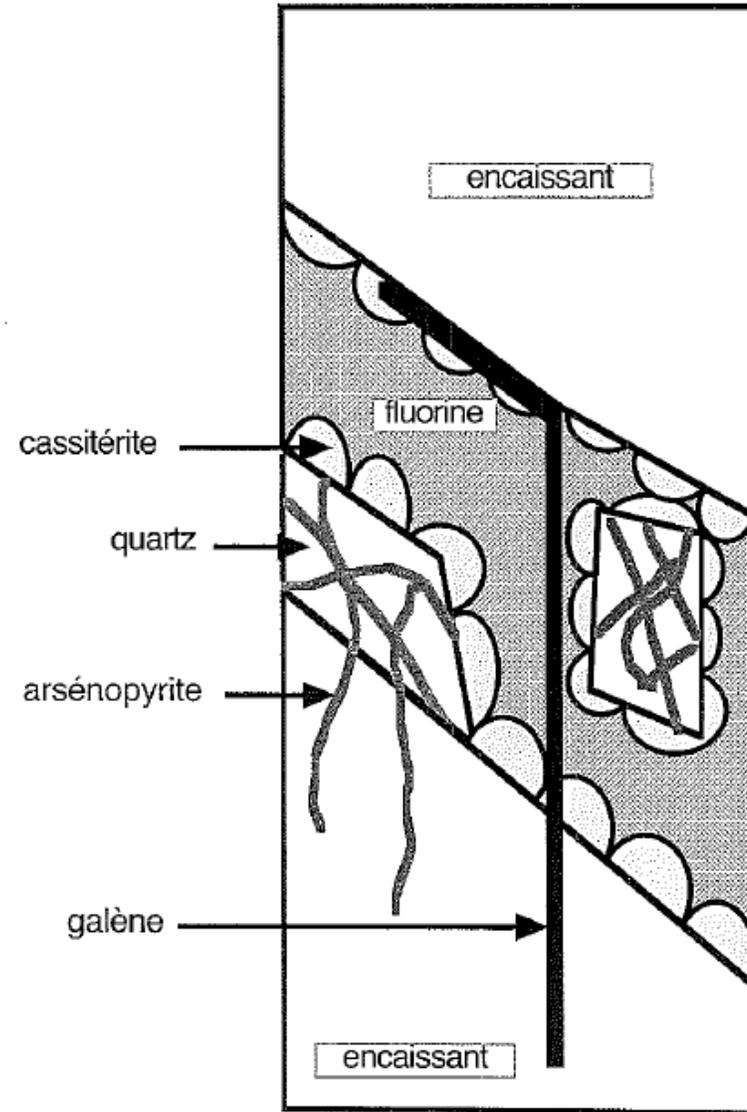
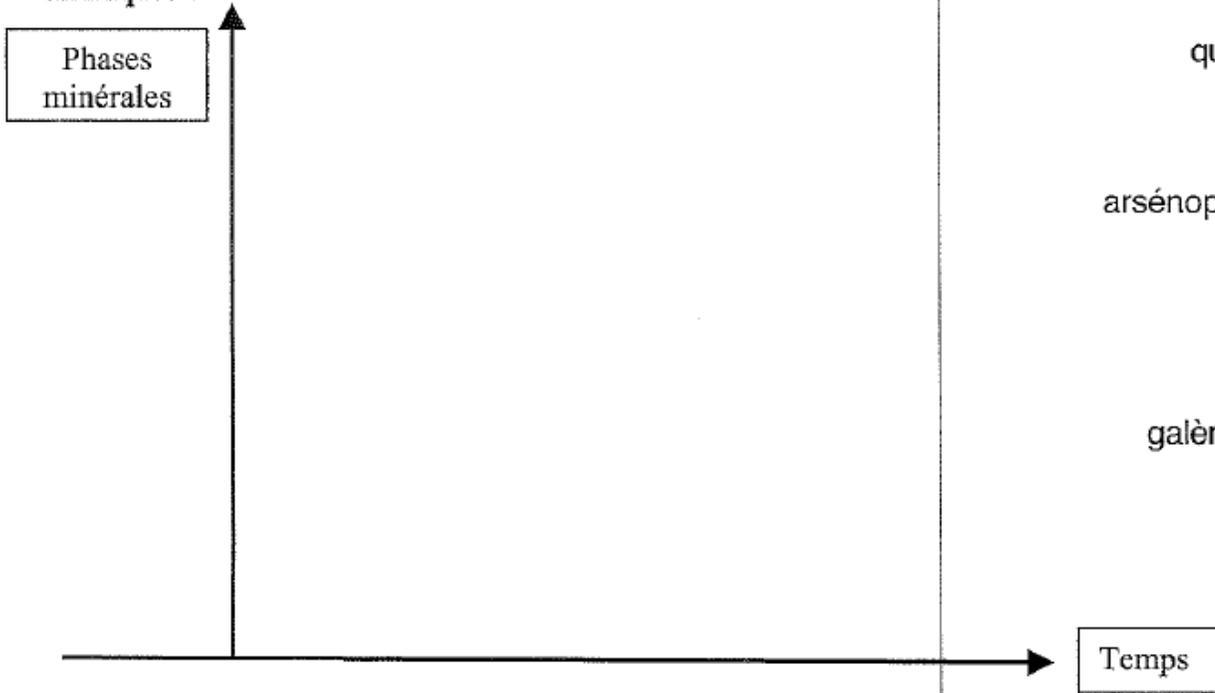
EXAMEN TP LGE5.04

NOM :

Le dessin ci-contre représente une des carottes des deux sondages réalisés.

Indiquez la succession événementielle à l'aide du diagramme ci-dessous. Vous figurerez les stades de fissuration et de bréchification à l'aide d'un trait ondulé.

La présence de galène vous suggère d'analyser quels éléments chimiques ?



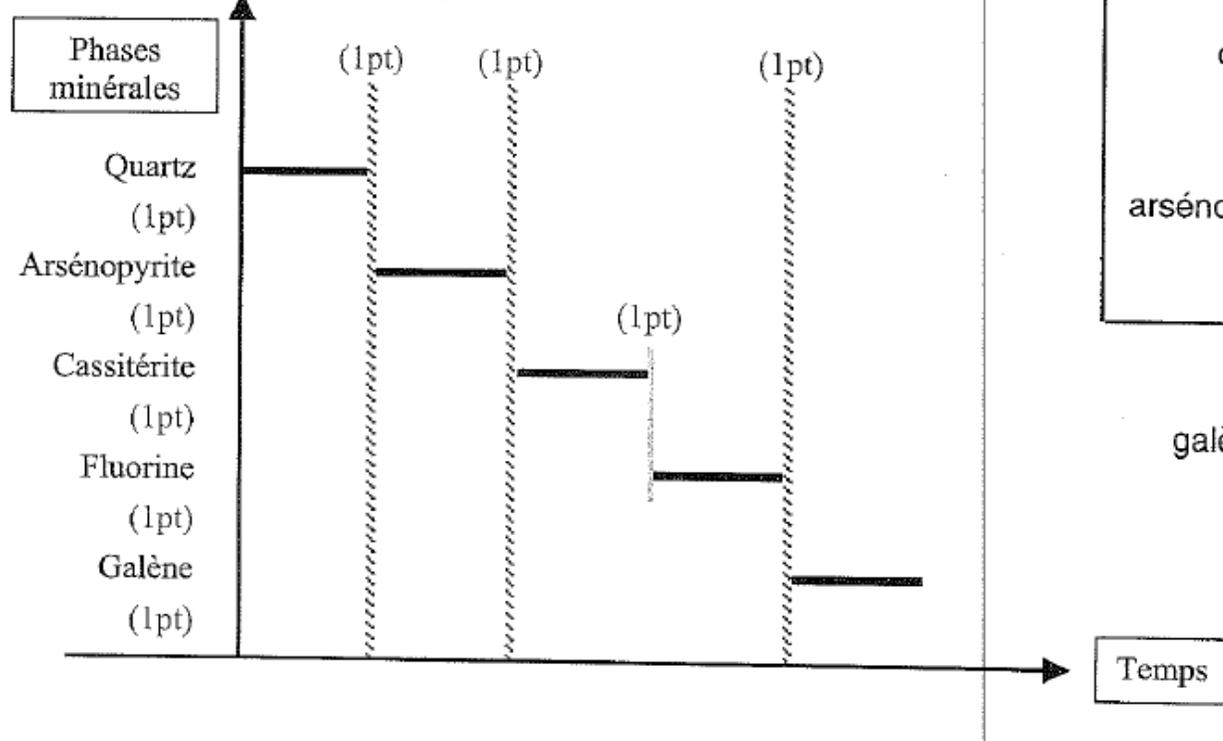
EXAMEN TP LGE5.04

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Le dessin ci-contre représente une des carottes des deux sondages réalisés.

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La présence de galène vous suggère d'analyser quels éléments chimiques ? - Ag, Bi (1pt).



Attention une fissure sécante peut prendre l'aspect d'une structure concordante.

