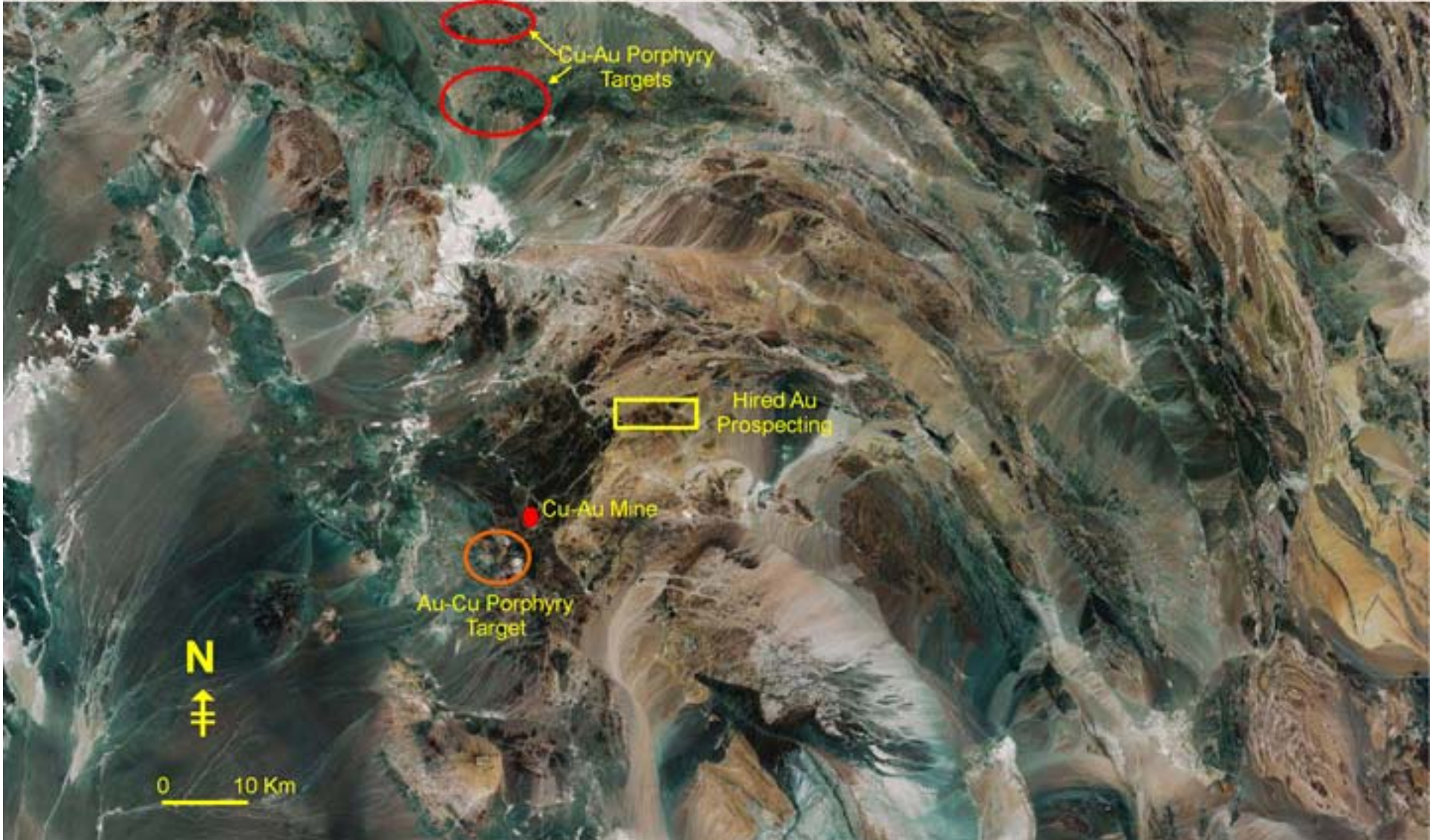


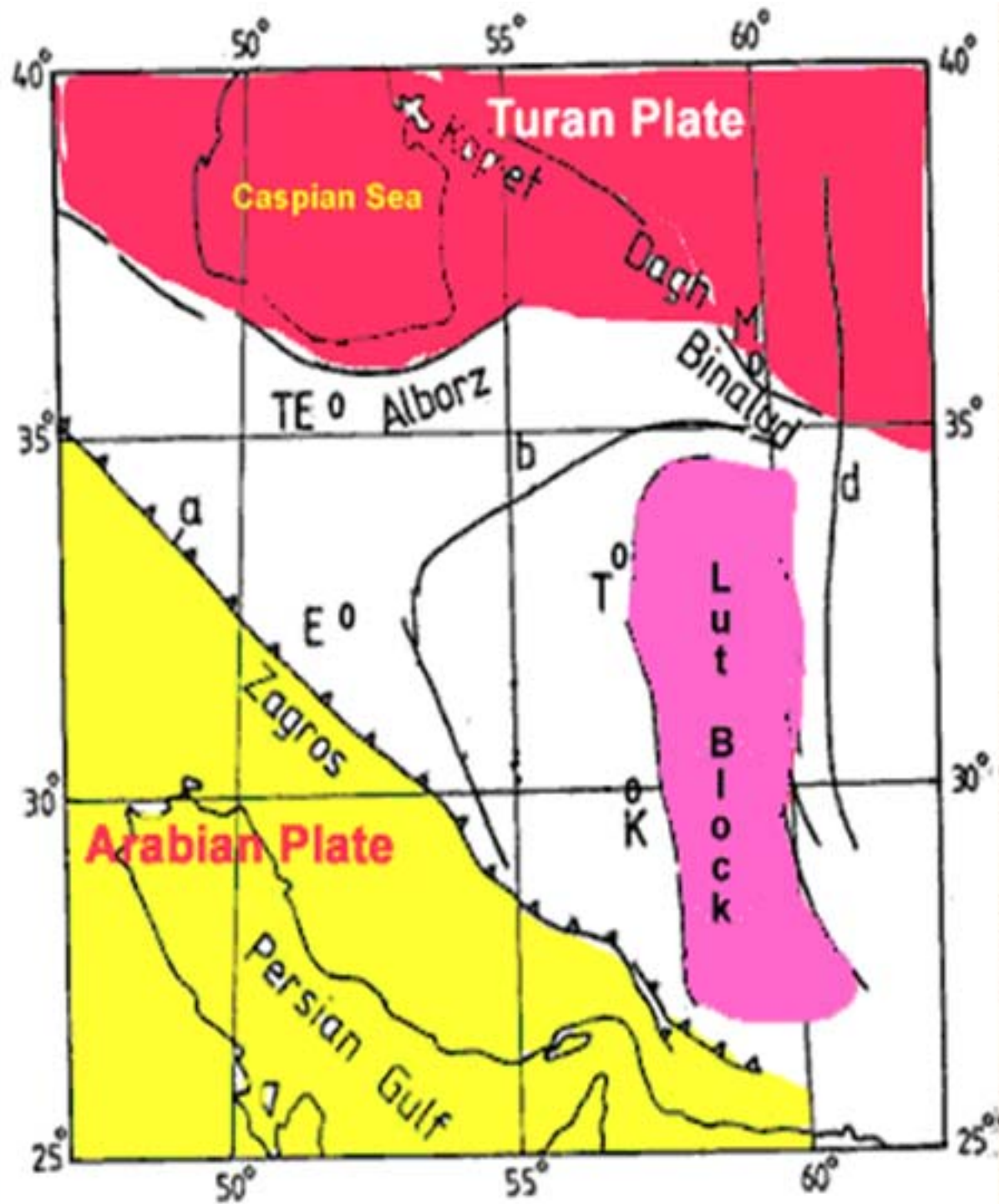
**Trace Element content of chalcopyrite,
pyrite, galena and sulfosalt minerals
at Qaleh Zari Cu-Ag-Au deposit
(Birjand, Iran)**

M.H. Karimpour



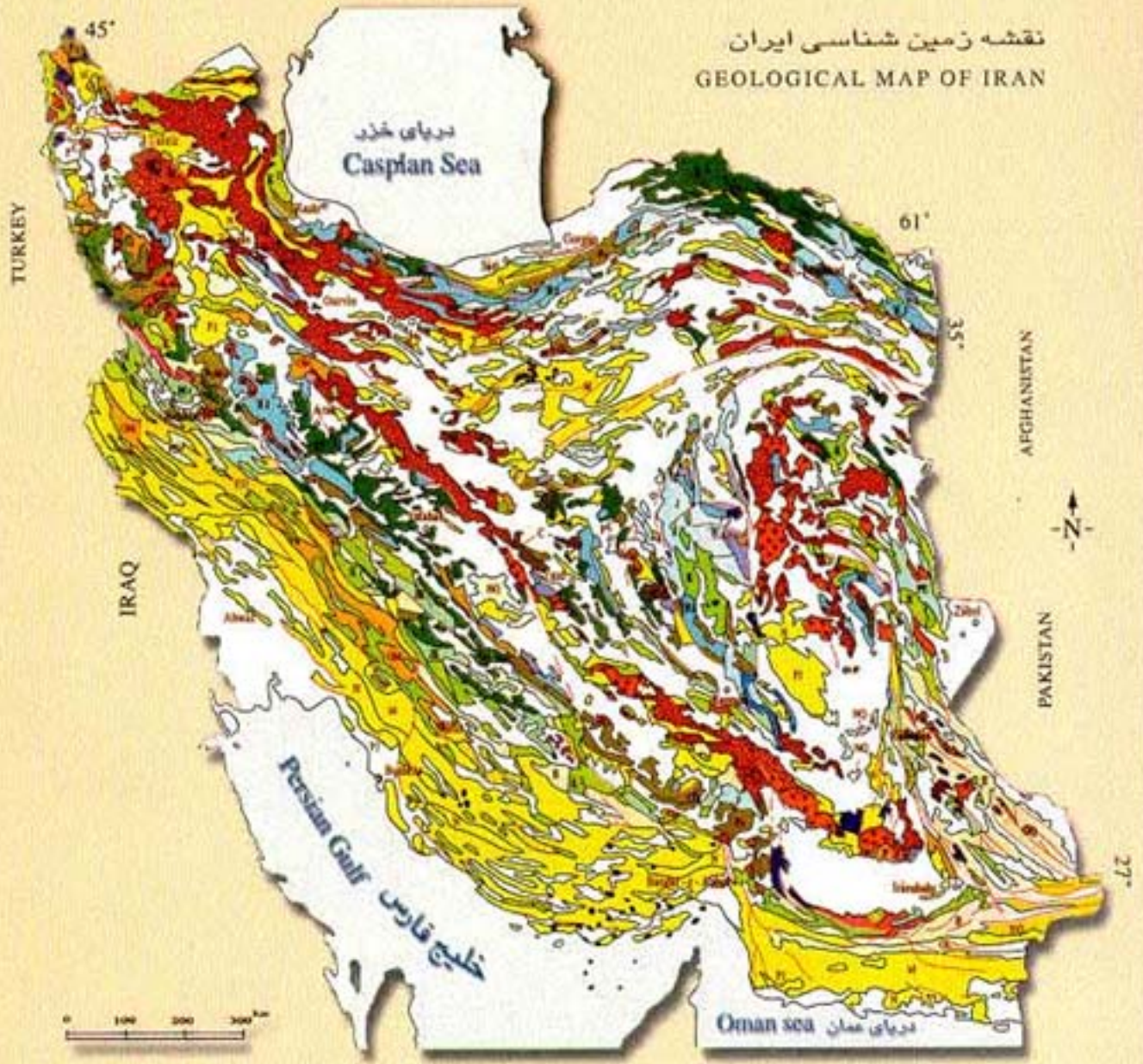






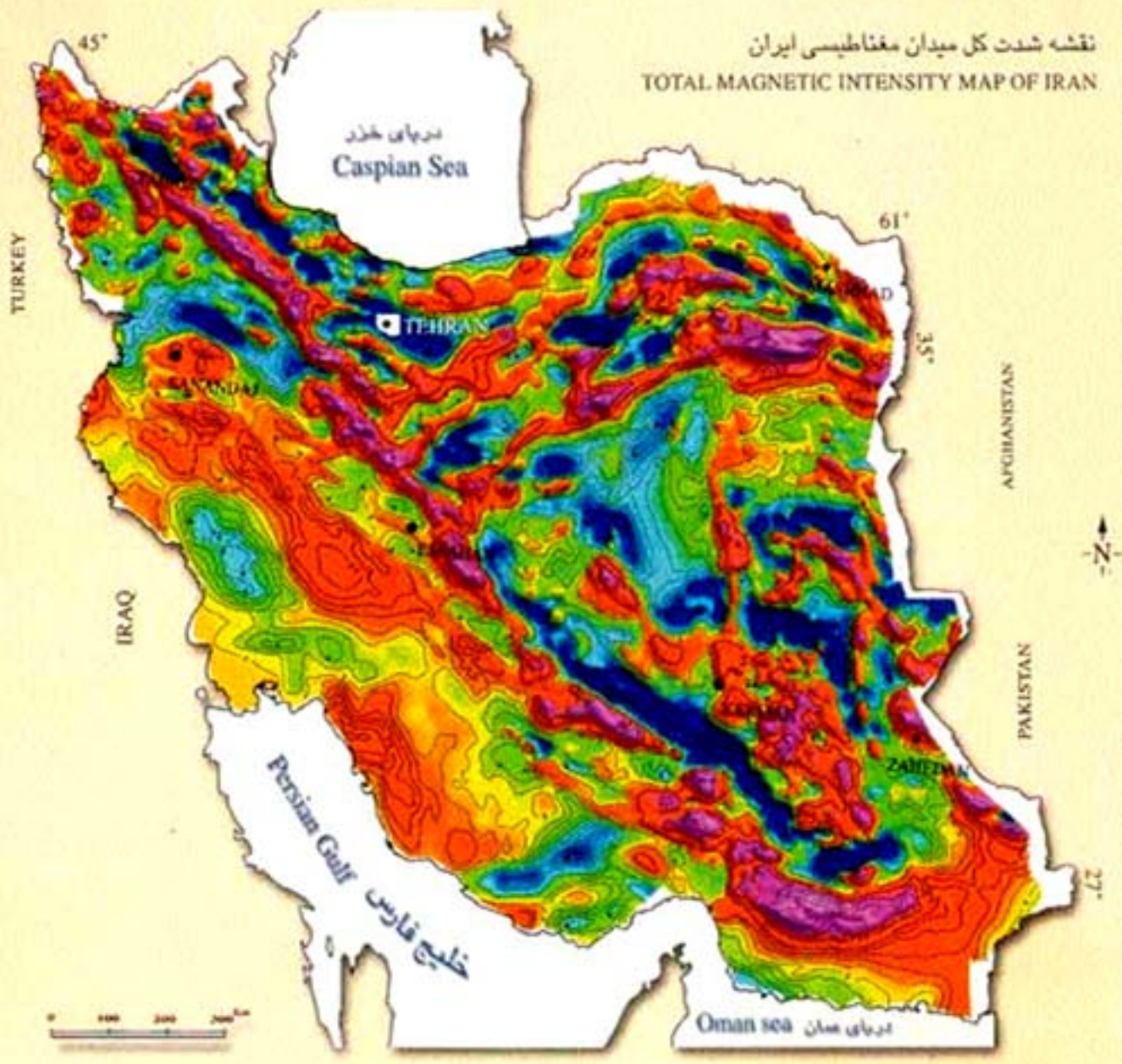
GEOLOGICAL SURVEY OF IRAN

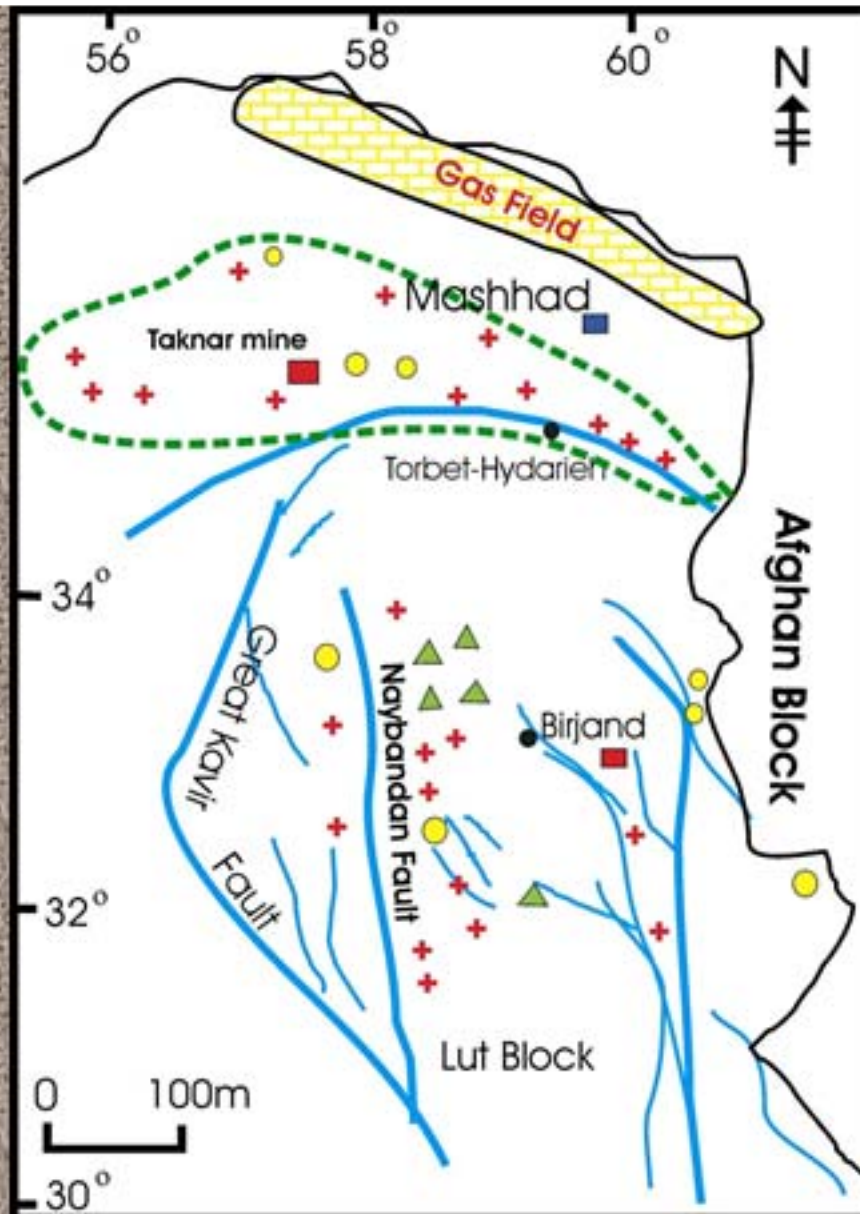
نقشه زمین شناسی ایران
GEOLOGICAL MAP OF IRAN



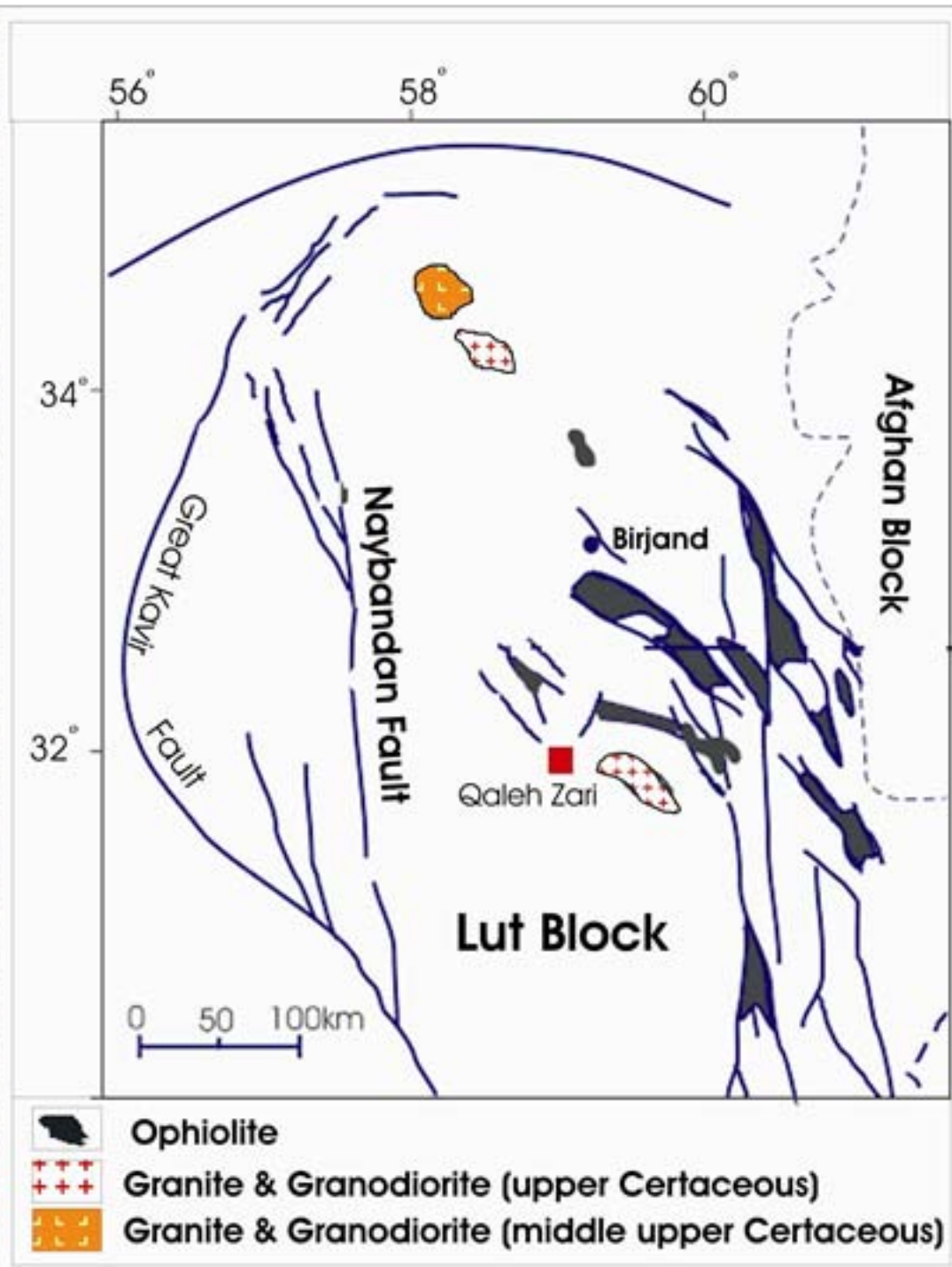
سازمان زمین شناسی و اکتشافات معدنی کشور

نقشه شدت کل میدان مغناطیسی ایران
TOTAL MAGNETIC INTENSITY MAP OF IRAN





- Massive Sulfide
- Cu-Au porphyry prospecting
- ▲ Cu-Au Vein type
- + Cu mineralization

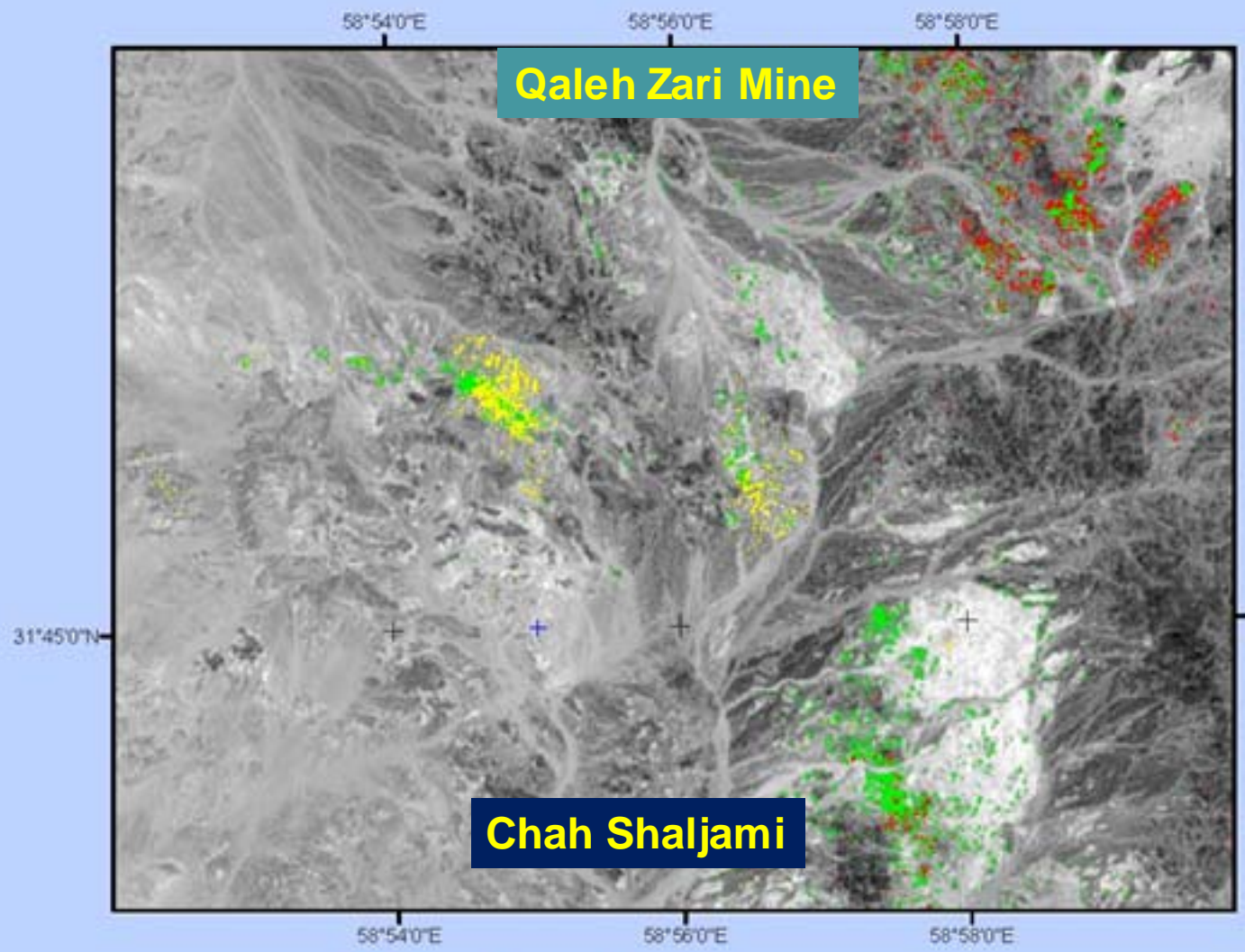




Qaleh Zari Mine

Chah Shaljami

0 3 Kilometers



-  Chlorite
-  Chlorite
-  Epidote

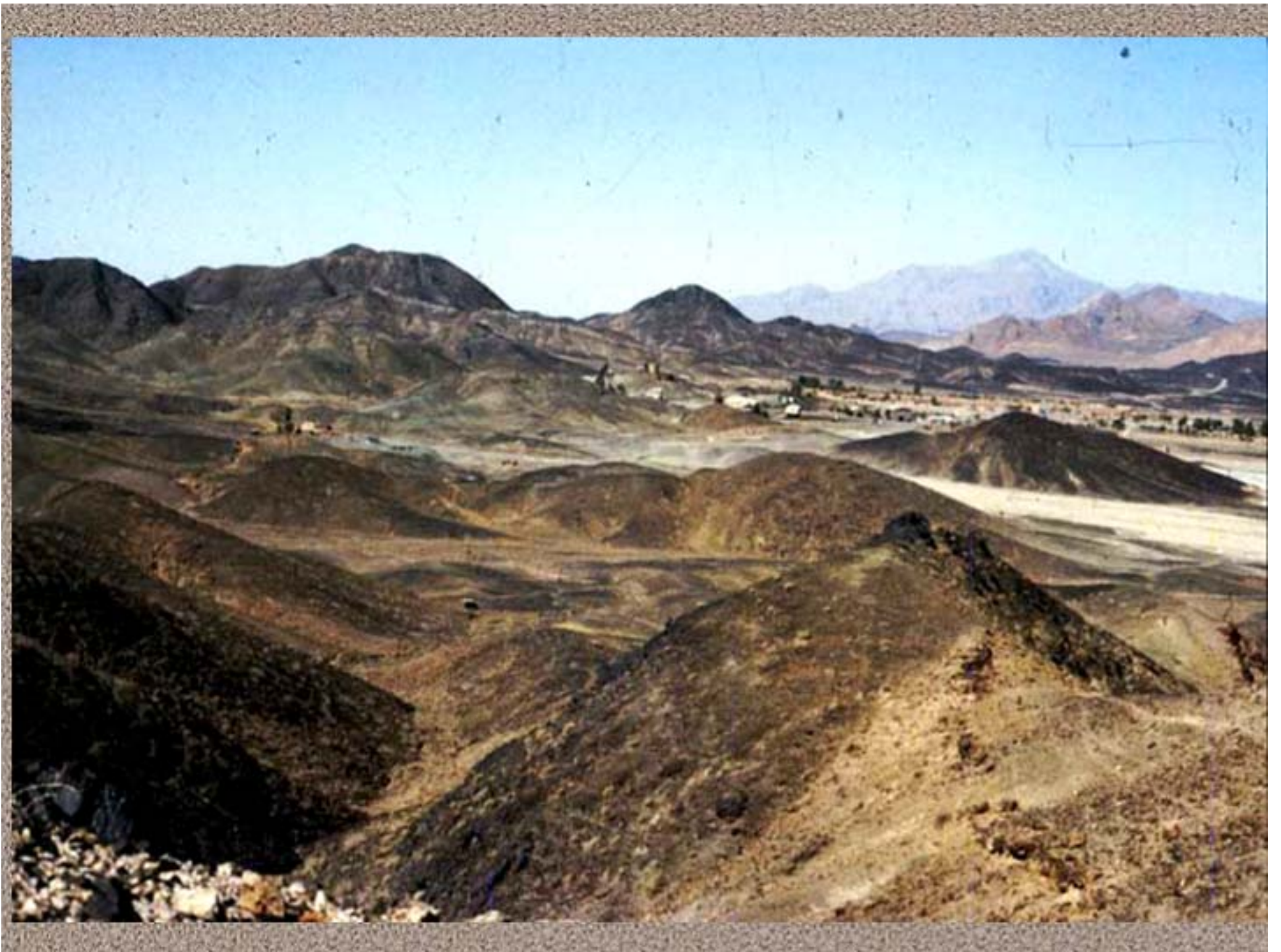
ASTER

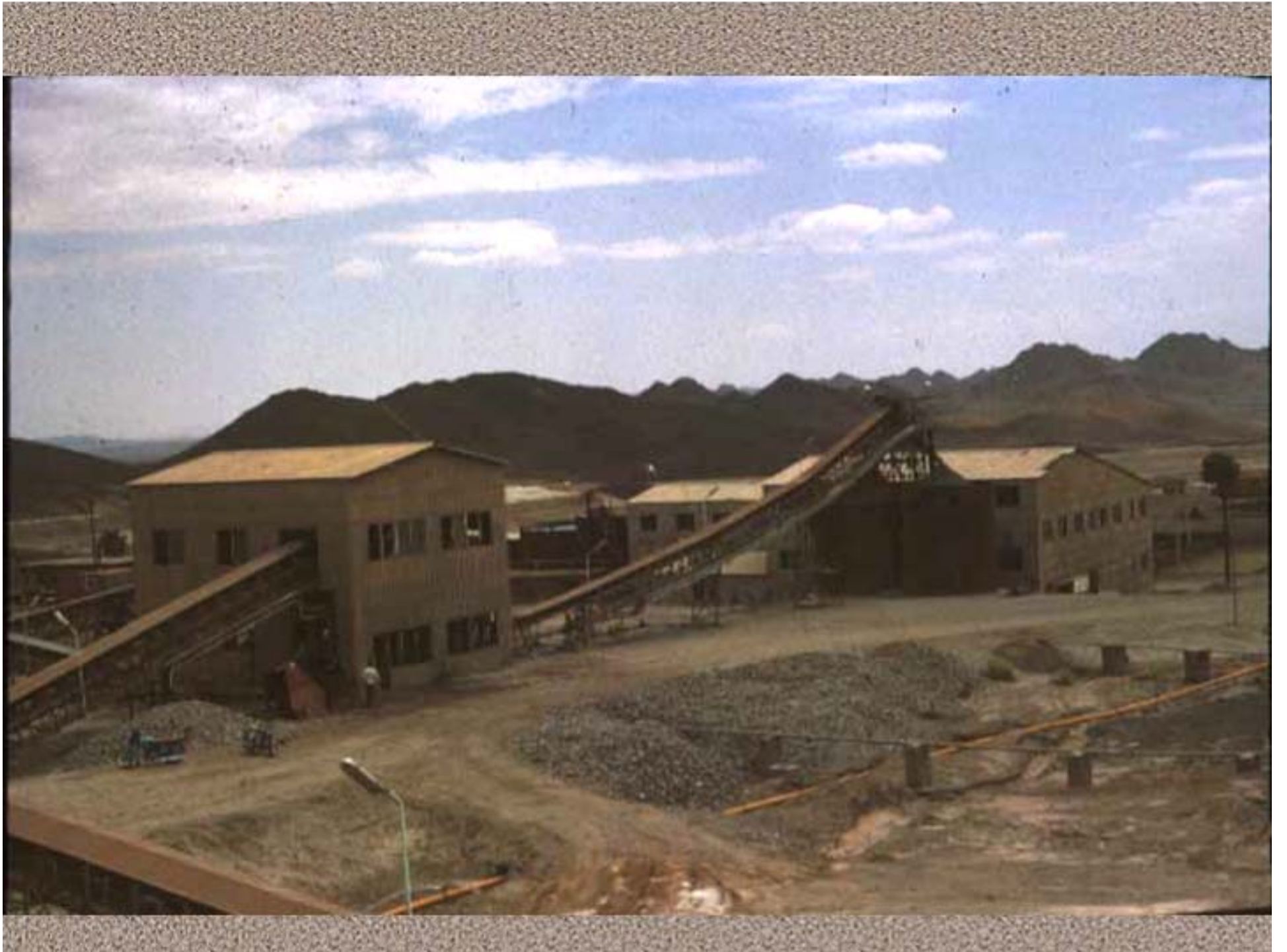
0 0.5 1 2 3 4 Kilometers

0 0.5 1 2 3 4 Miles

M.H Karimpour, 2006











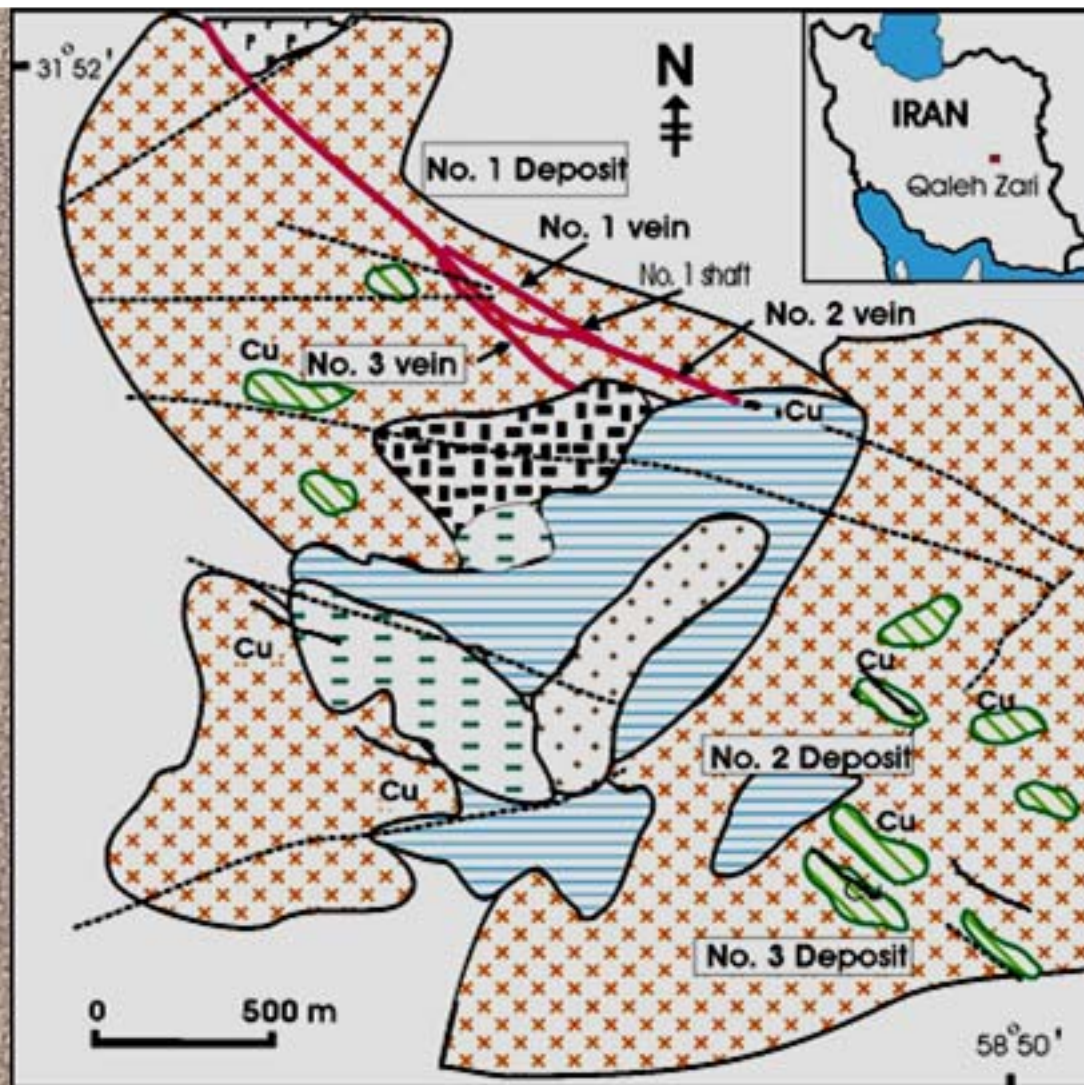












Cu, Pb-Zn mineralization in Central Lut

- **Eocene (40-39 M.a) Cu (Qaleh-Zari)**
- **Eocene (44-41 M.a) Pb-Zn (Seh Changi)**
- **Upper Cretaceous (75 M.a) Cu-porphyry (Gazu)**
- **Mid- Jurassic (164-170 M.a) Cu- porphyry
(Sorkh Kuh)**

I- Iron Oxides Copper Gold
IOCG

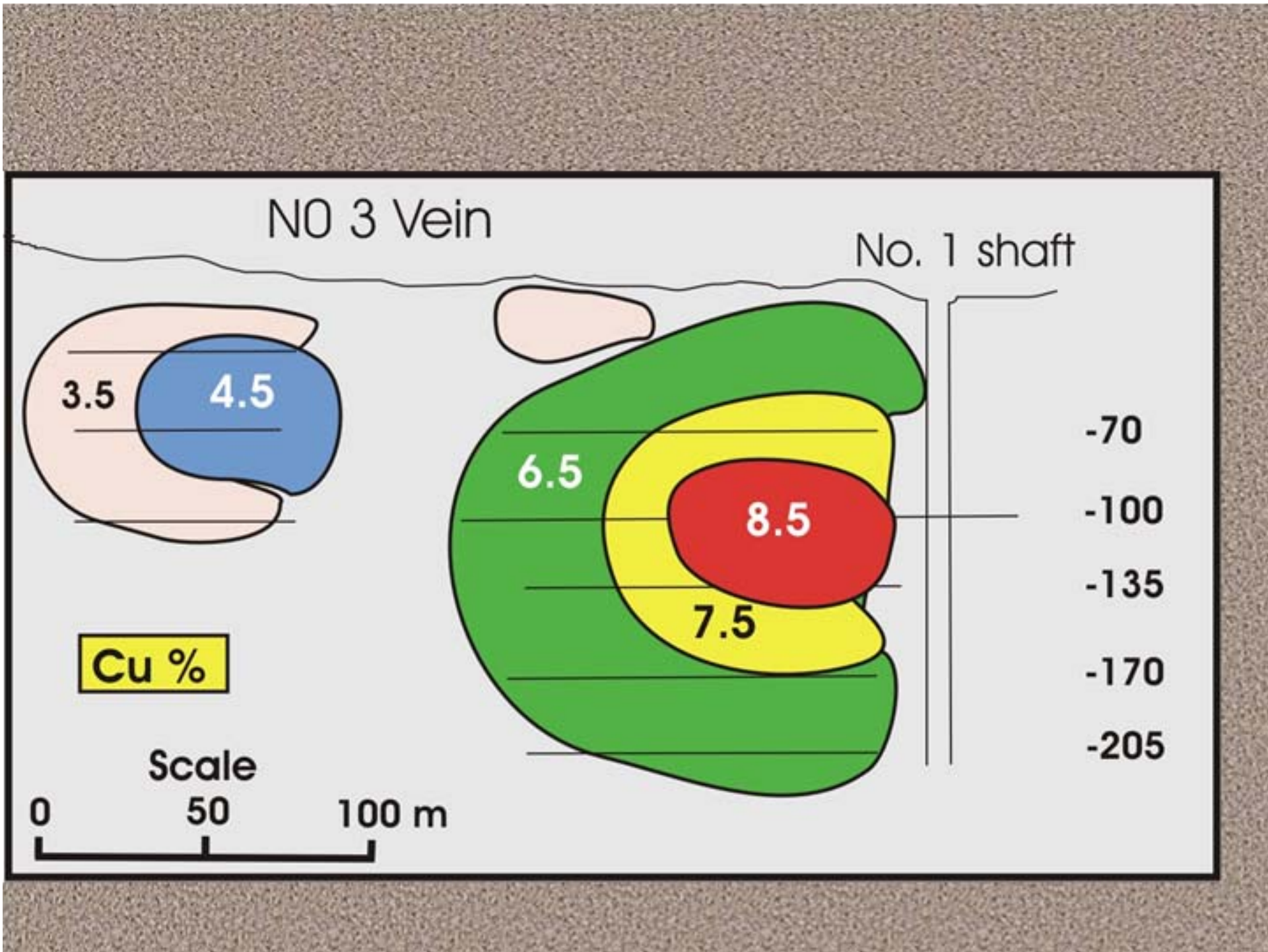
- 1- IOCG Specularite, Au (Kuh Zar)
- 2- IOCG Specularite, Cu-Au (Qaleh Zari)
- 3- IOCG Specularite-Mt, Cu-Au (Sadaat Abad)
- 4- IOCG Magnetite, Cu-Au (Candelaria)
- 5- IOCG Magnetite, Au (Tannurjeh)
- 6- IOCG Specularite-Mt, Cu-Au-U-REE (Olympic Dam)

II- Magnetite Type

- 1- Magnetite-apatite (Choghart)
- 2- Magnetite- REE (Esphordi)
- 3- Magnetite (Sangan)

The average ore grade and width of veins

| Vein | Depth | Width (m) | Cu % | Au ppm | Ag ppm | Bi % | Pb % | Zn % | As ppm |
|-------------|--------------|------------------|-------------|---------------|---------------|-------------|-------------|-------------|---------------|
| 1 | 135 | 2.7 | 7 | 4.5 | 180 | N.A | N.A | N.A | N.A |
| 2 | 70 | 3 | 8.7 | 0.3 | 264 | N.A | N.A | N.A | N.A |
| 2 | 100 | 0.3 | 8.9 | 8.7 | 620 | 0.28 | 0.3 | 0.1 | 70 |
| 3 | 100 | 0.8 | 7.3 | 40 | 255 | 0.24 | 0.13 | 0.03 | 50 |



N0 3 Vein

No. 1 shaft



-70
-100
-135
-170
-205

1.5

0.8

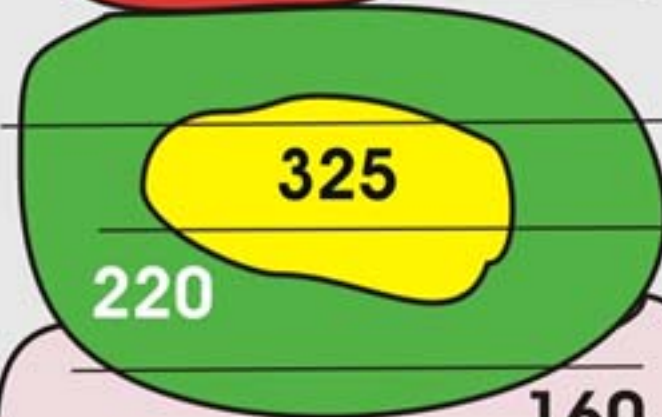
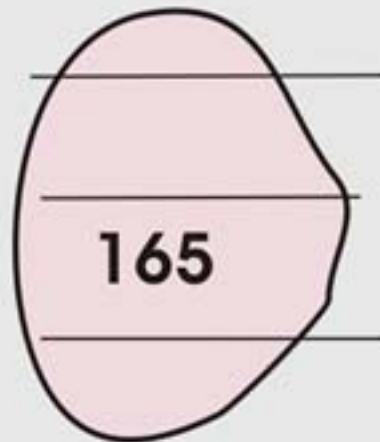
Au (ppm)

Scale



N0 3 Vein

No. 1 shaft



-70

-100

-135

-170

-205

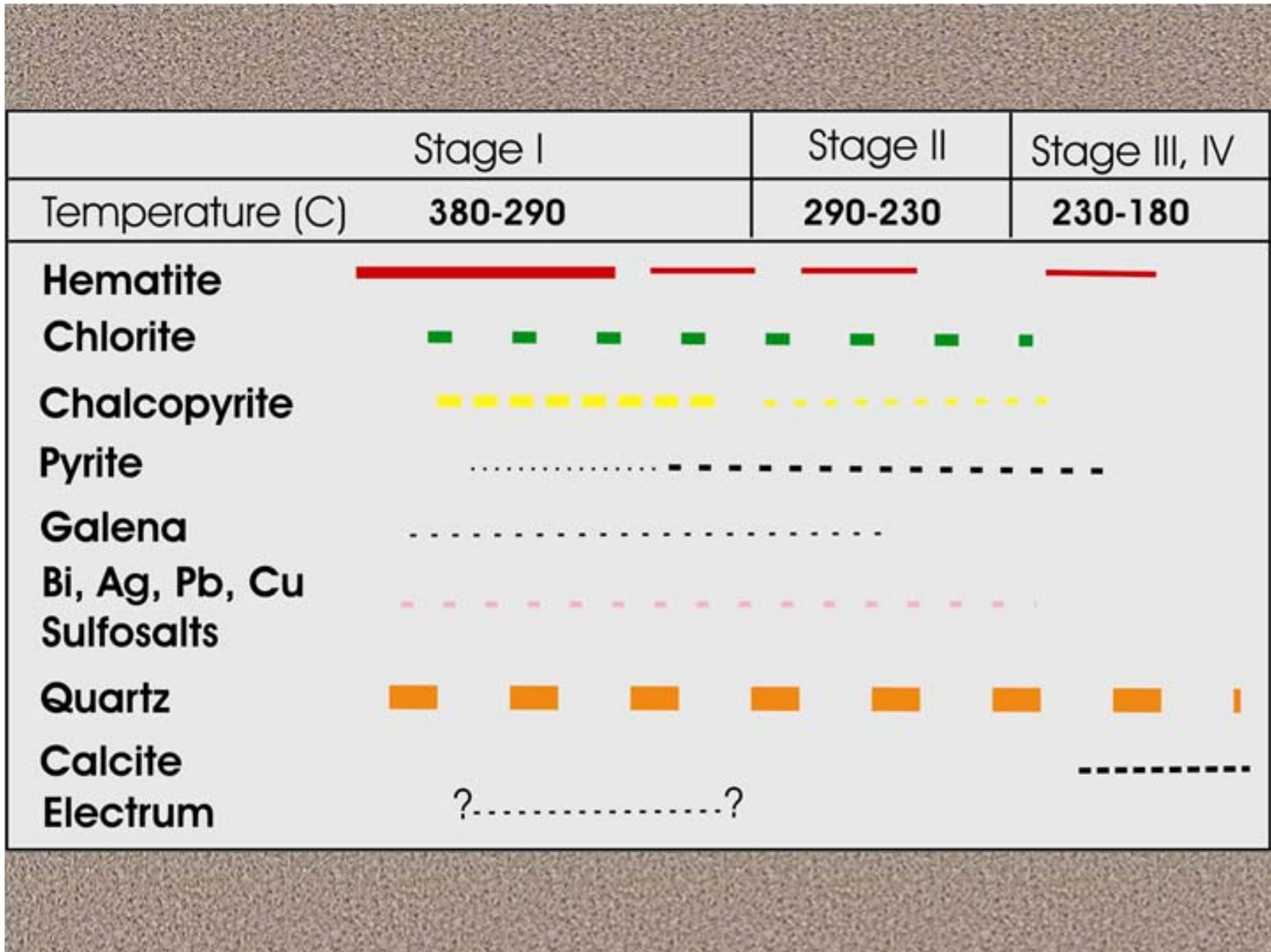
Scale

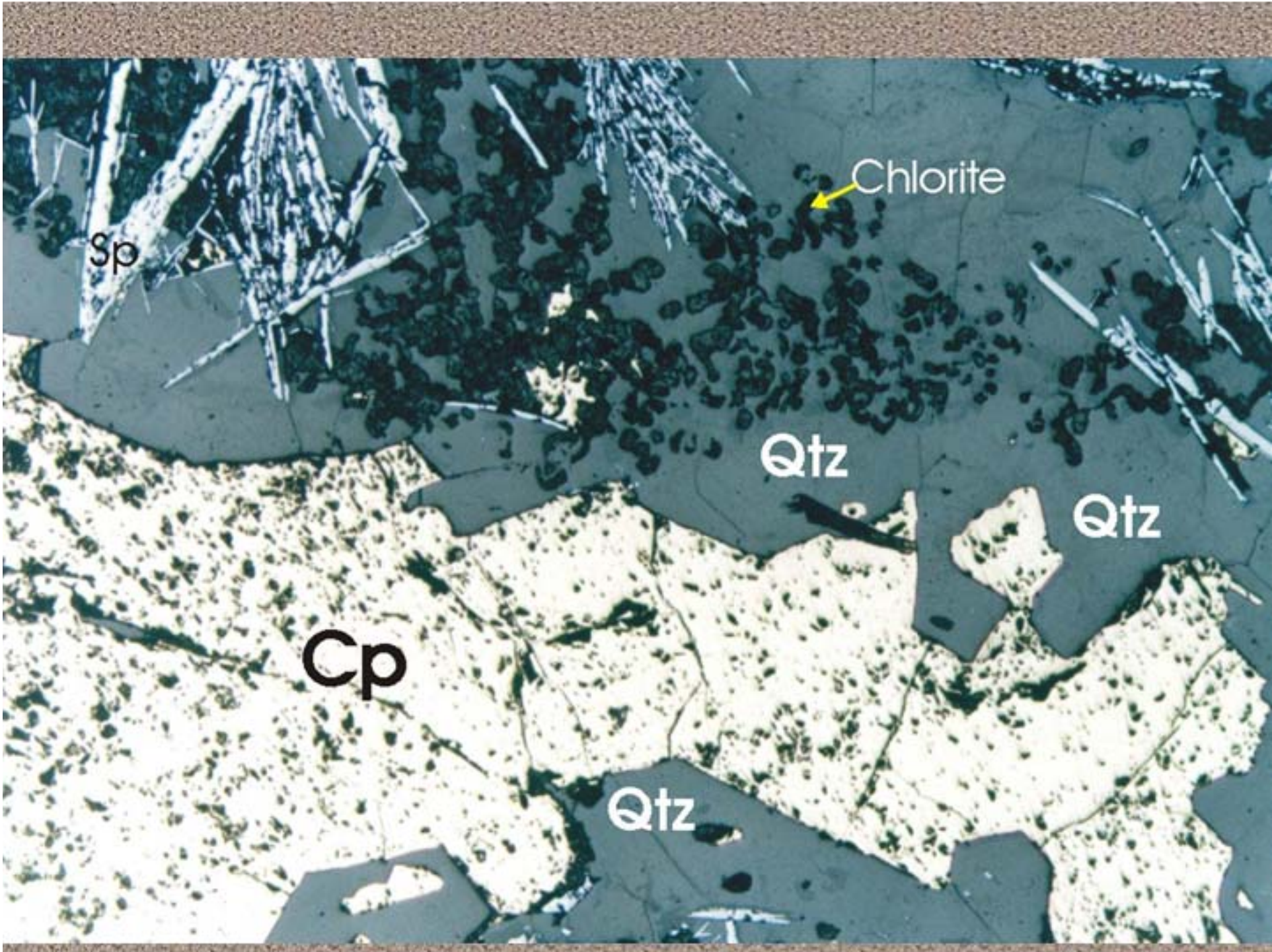
0

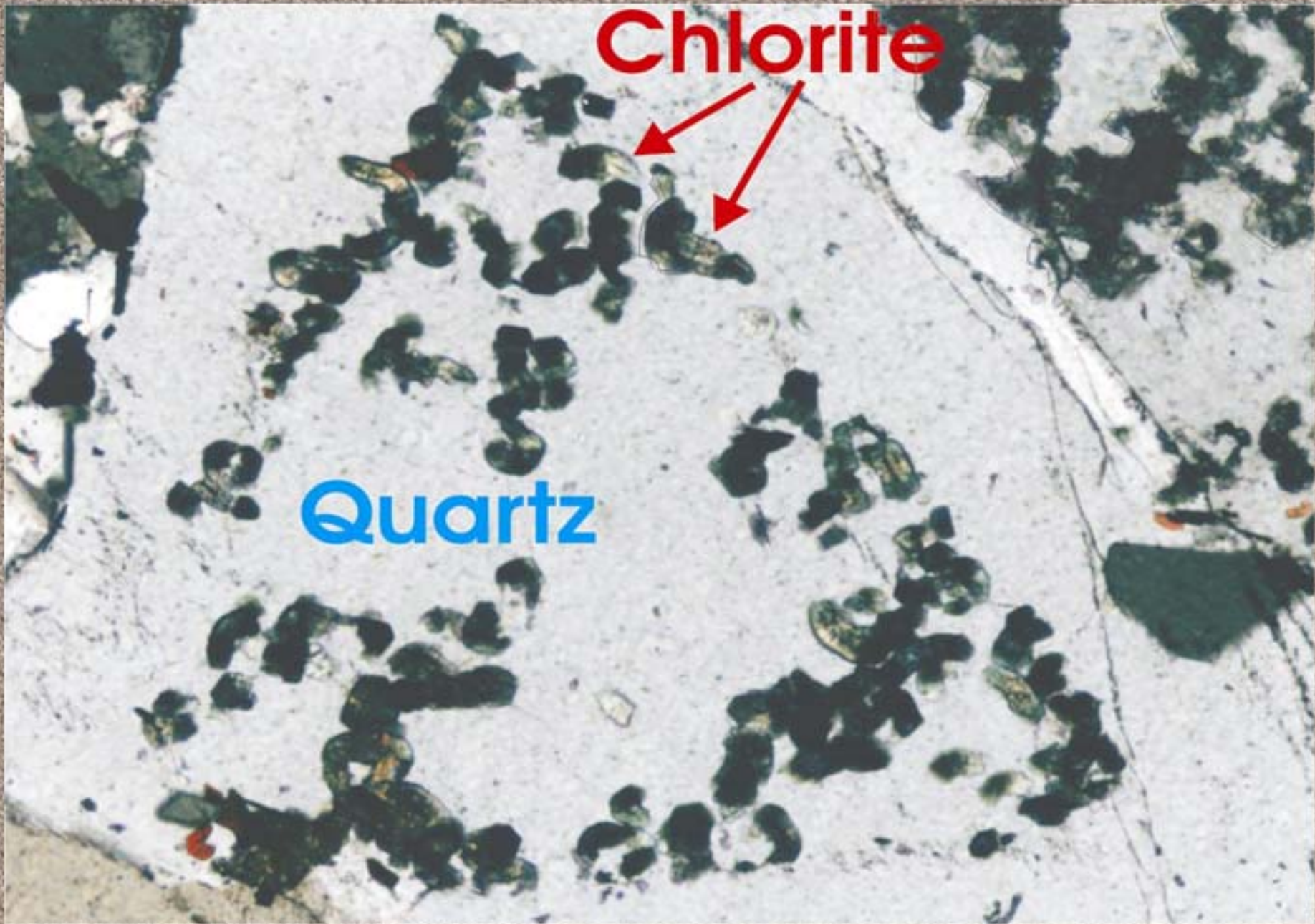
50

100 m

Ag (ppm)



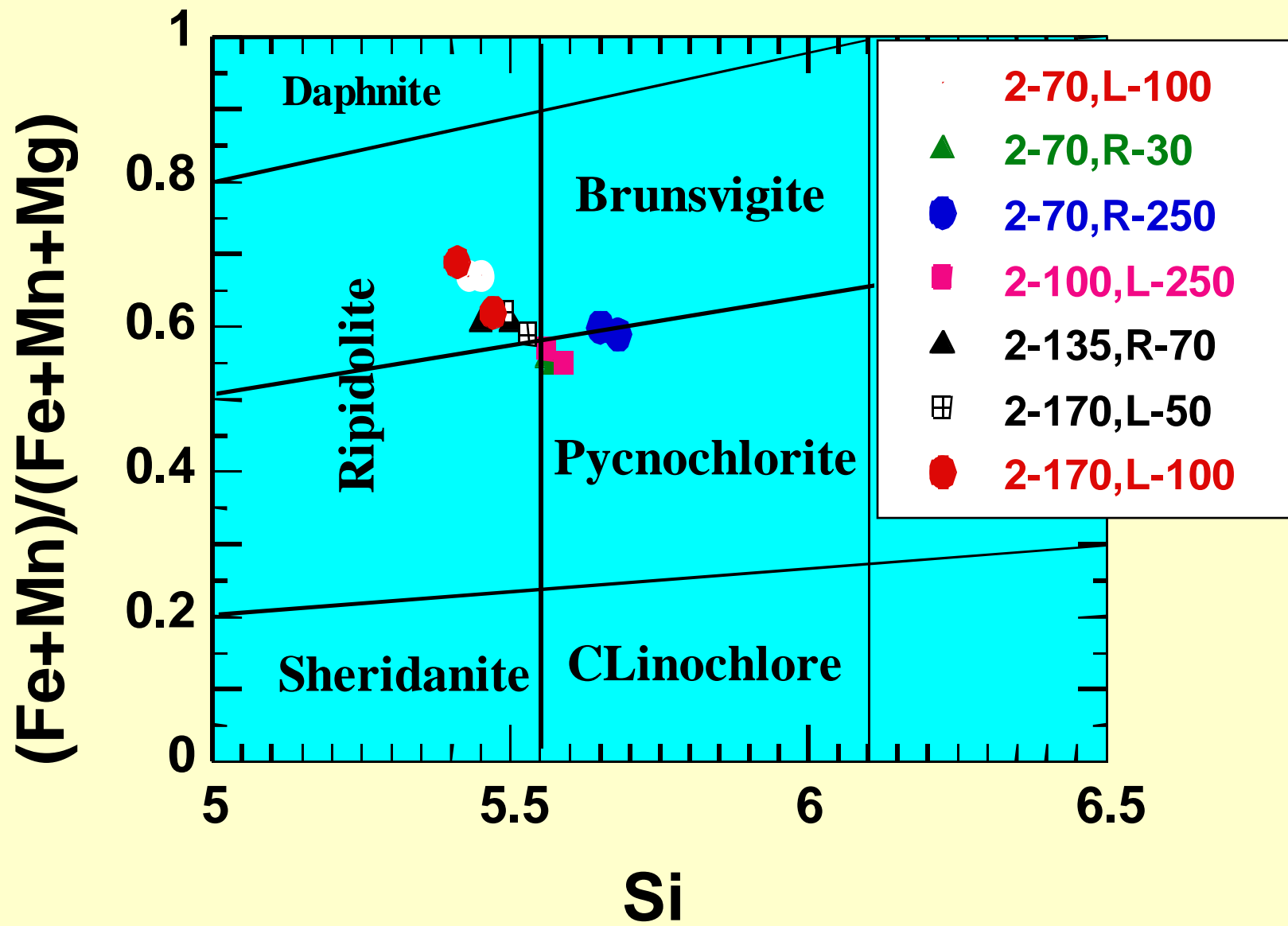


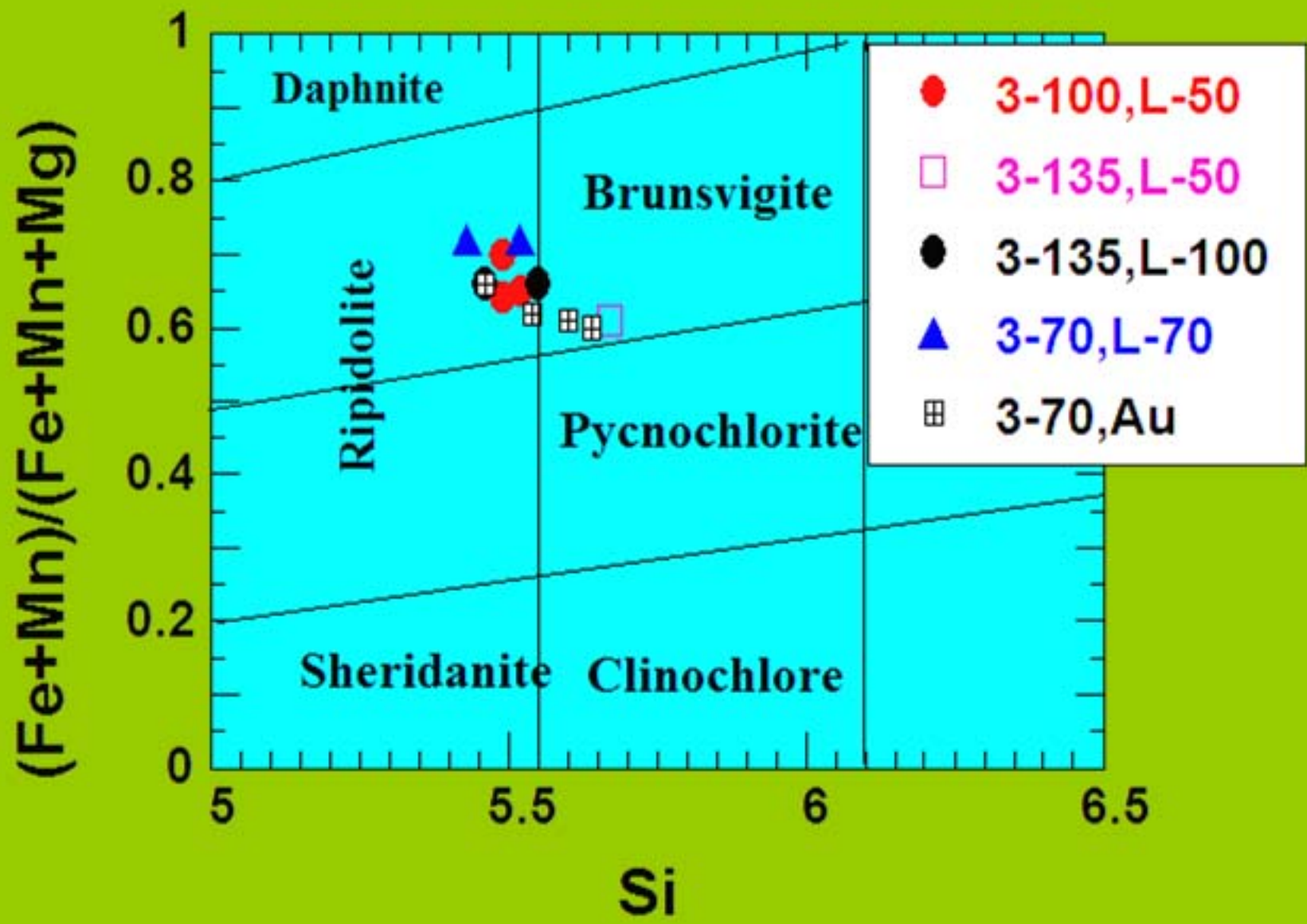


Chlorite

Quartz

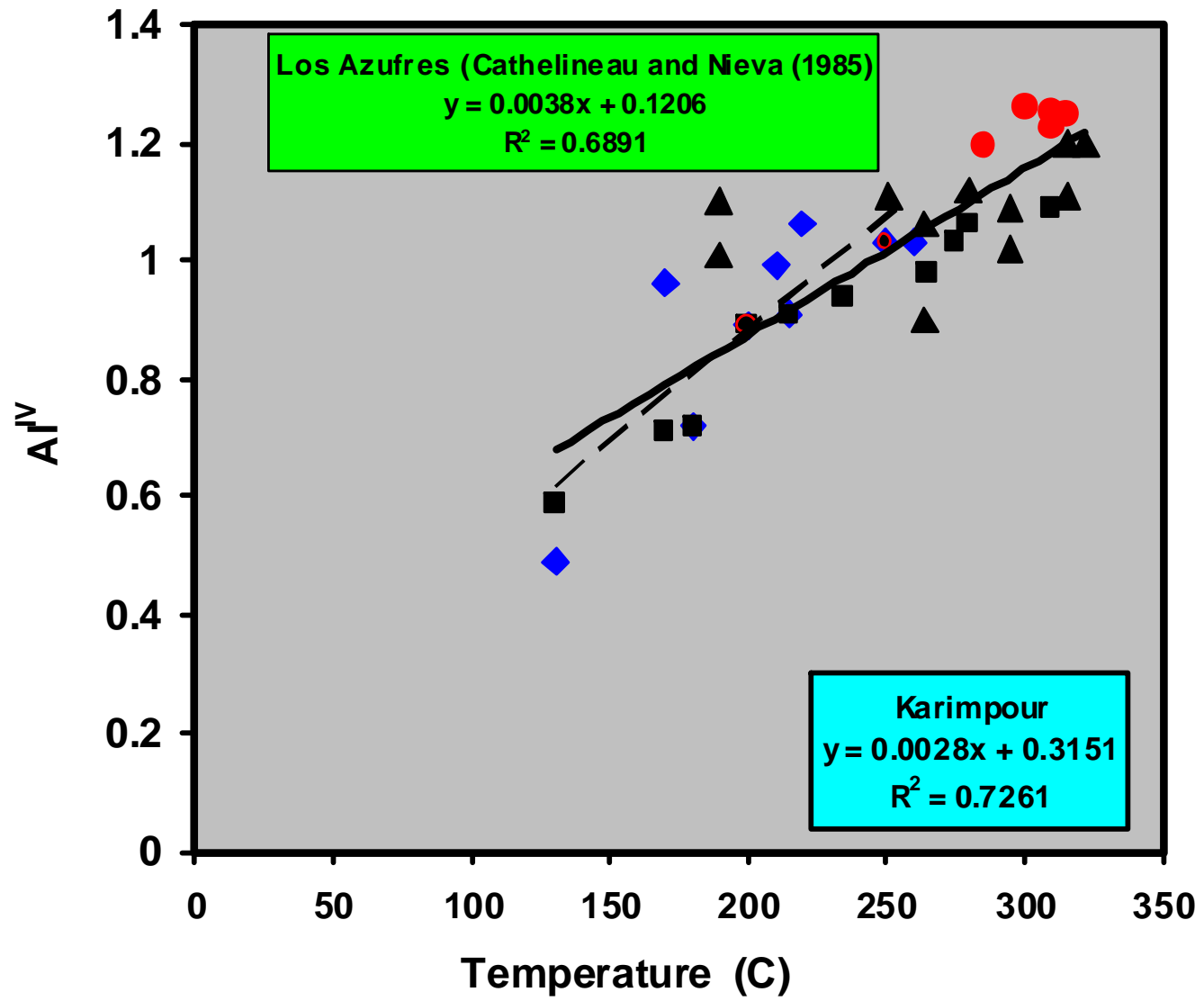






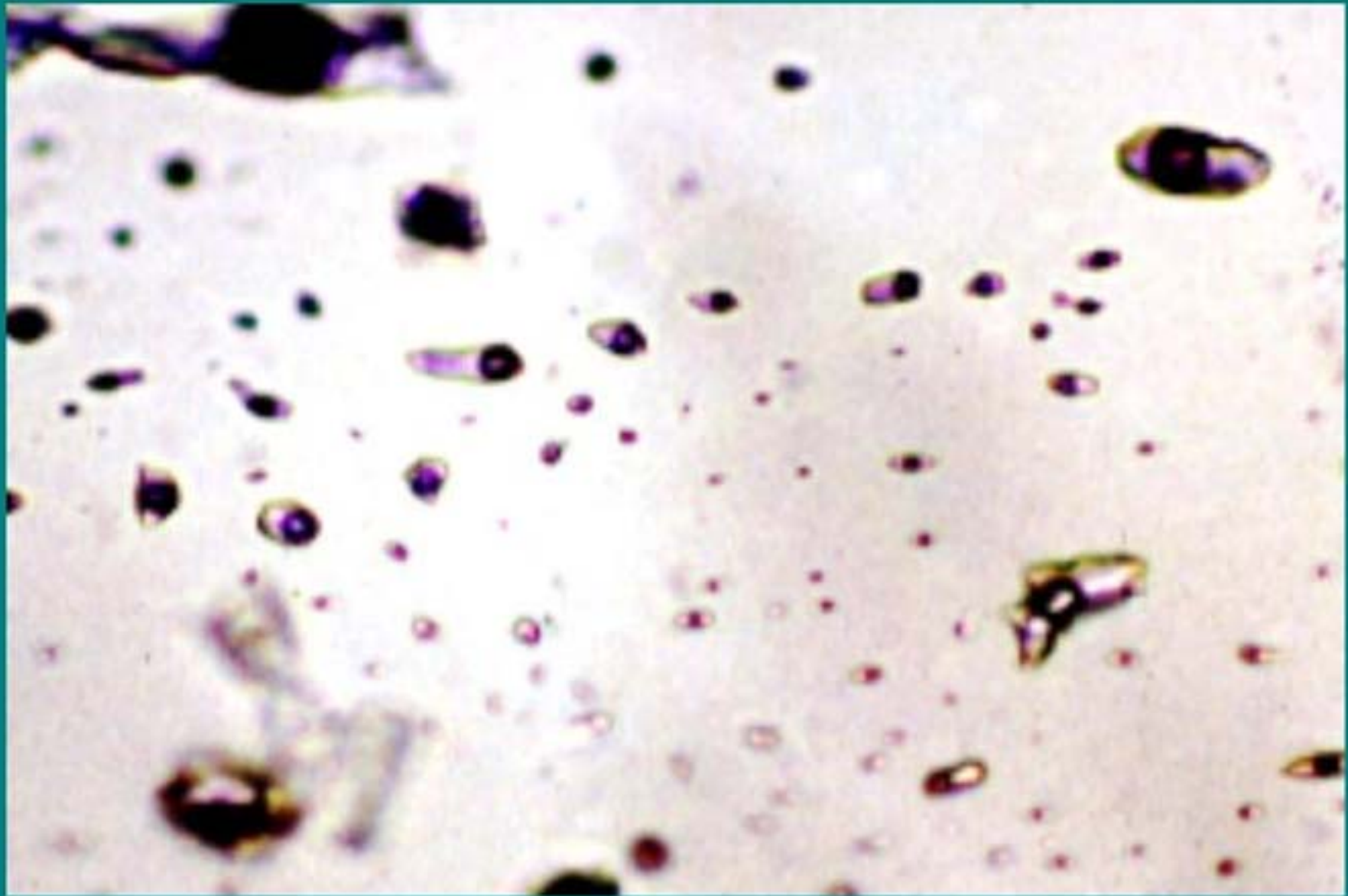
Types of Chlorite

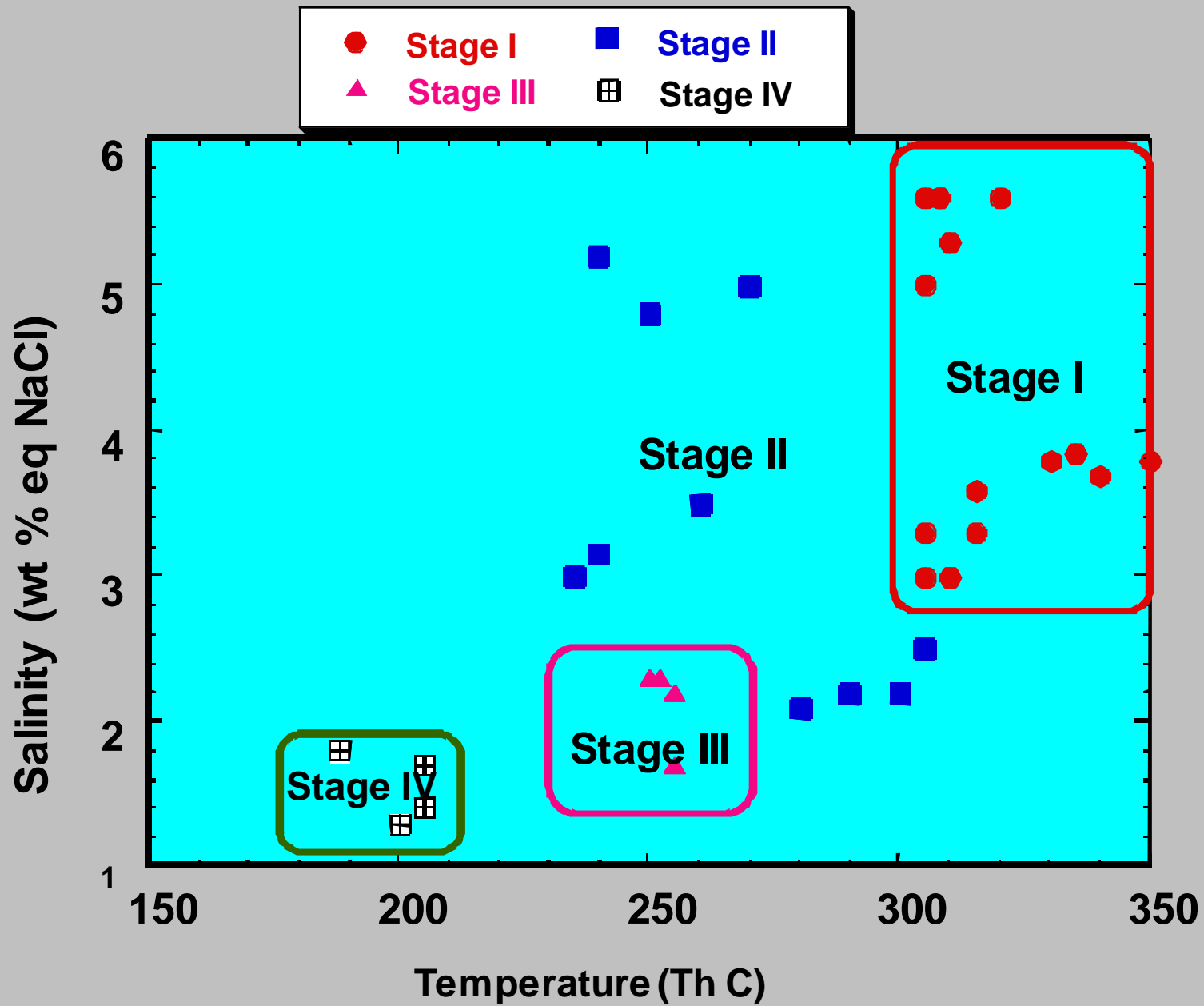
**Fe-Ripidolite
with minor bronsvigite-
pycnochlorite**

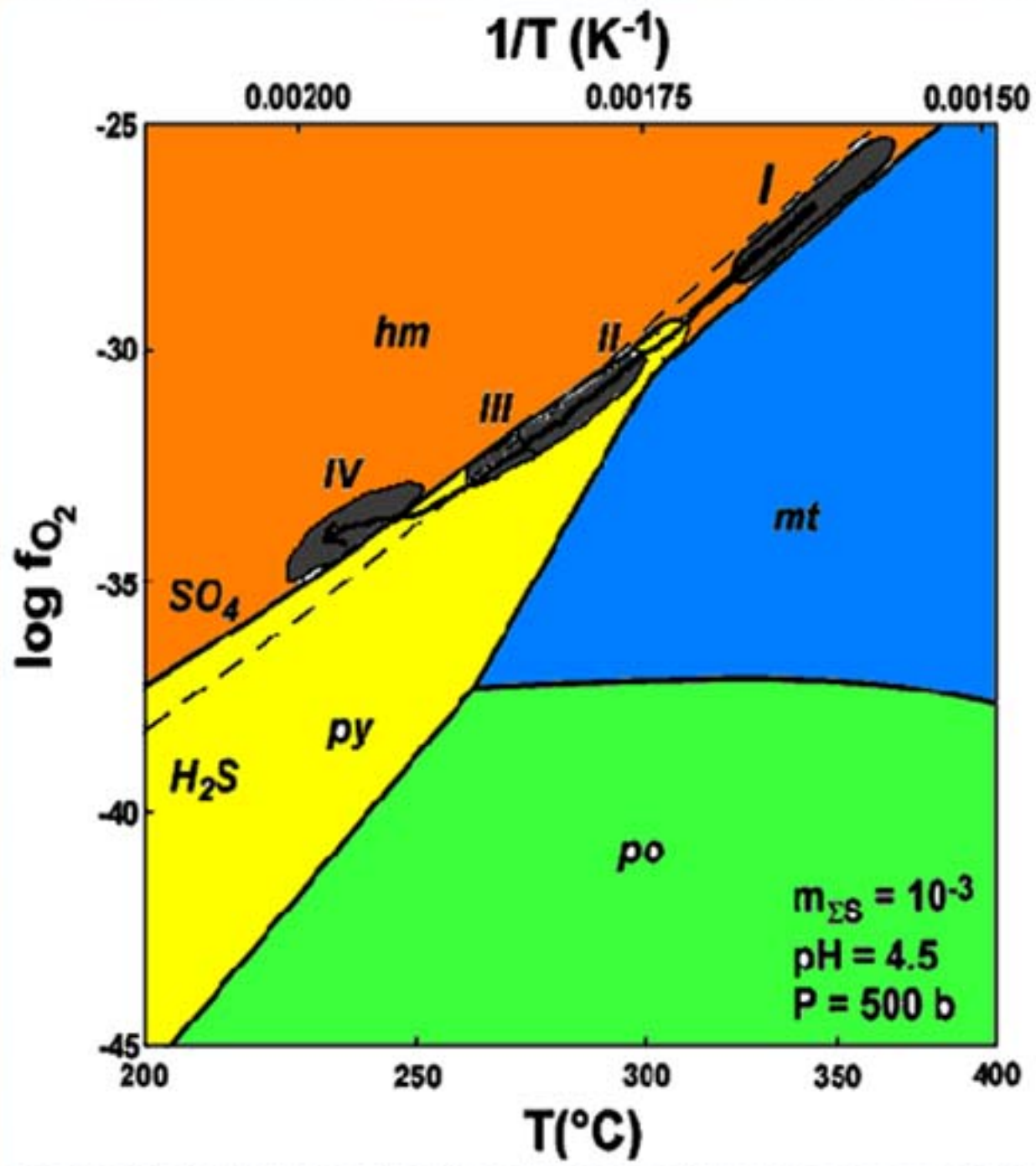


- ◆ Los Azufres(1)
- Los Azufres(2)
- ▲ Salton Sea
- Qaleh-Zari

**FLUID INCLUSION THERMOMETRY,
STABLE ISOTOPE GEOCHEMISTRY
AND GENESIS**







Sulfosalts

Major and trace elements

| | Stage I | Stage II | Stage II, IV |
|---|--------------|-----------|--------------|
| Temperature C | 380-290 | 290- 230 | 230-180 |
| Hematite | | | |
| Quartz | | | |
| Chalcopyrite | | | |
| Pyrite | | | |
| Aikinite (no inclusion) | ----- | | |
| Aikinite (Ag-rich or arcubiste inclusion) | | - - - - - | |
| Aikinite (galena intergrowth) | | - - - - - | |
| Galena (matildite exsolution) | | ----- | |
| Galena (Ag-rich inclusion) | | ----- | |
| Galena (wittichinite inclusion) | | ----- | |
| Galena (Aikinite intergrowth) | | - - - - - | |
| Wittichinite | ----- | | |
| Arcubisite | | ----- | |
| Matildite | | ----- | |
| Ag- rich sulfosalts | | ----- | |
| Bismuthinite- Aikinite series | | ----- | |
| Cosalite & Berryite | | ----- | |
| Chlorite | ----- | | |
| Calcite | | | ----- |
| Electrum | ?- - - - -?- | | |

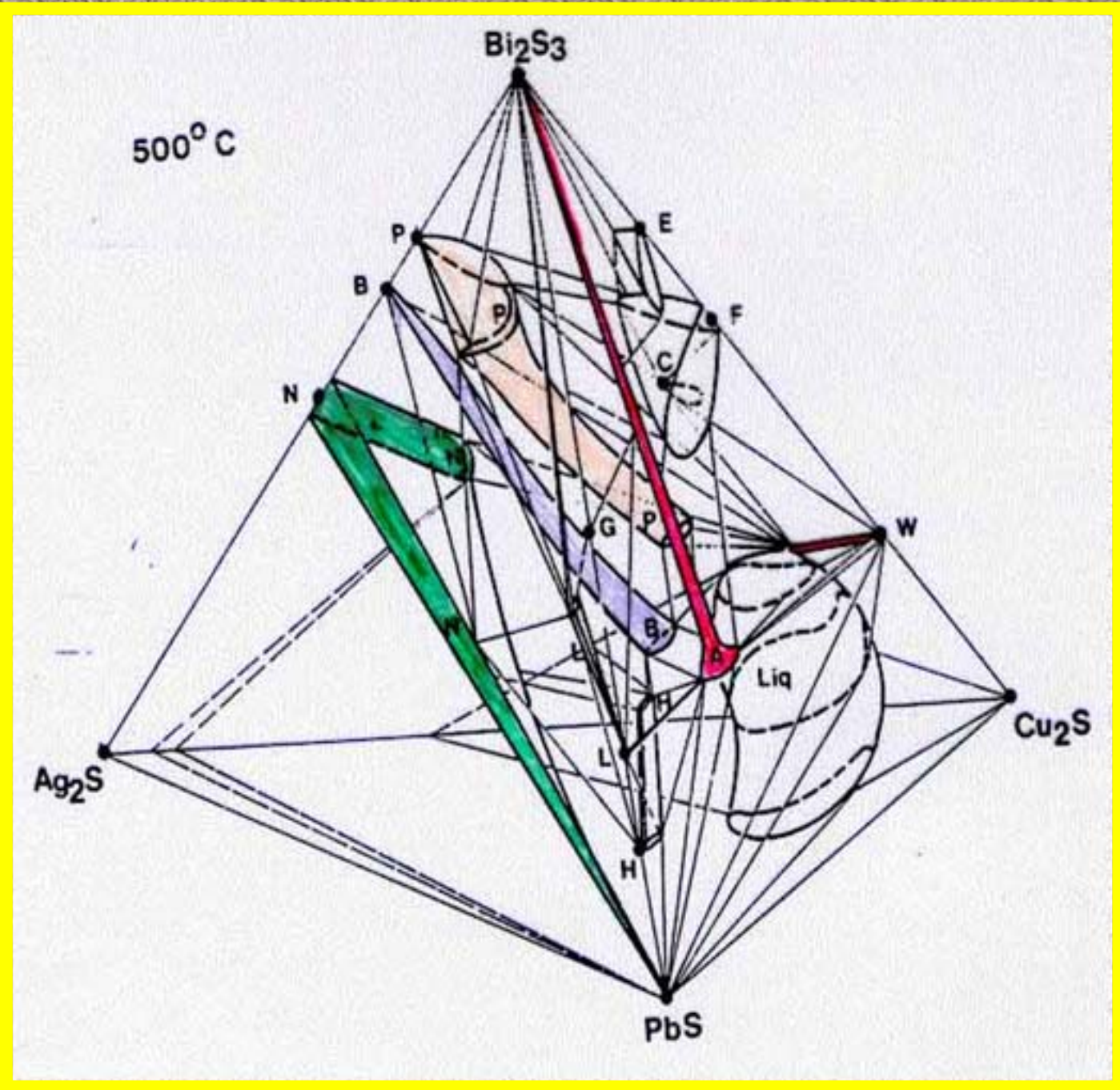




Fig. 10-11. Phase relations in the $\text{Cu}_2\text{S}-\text{Bi}_2\text{S}_3$ system (after G. M. Sturges, 1958).

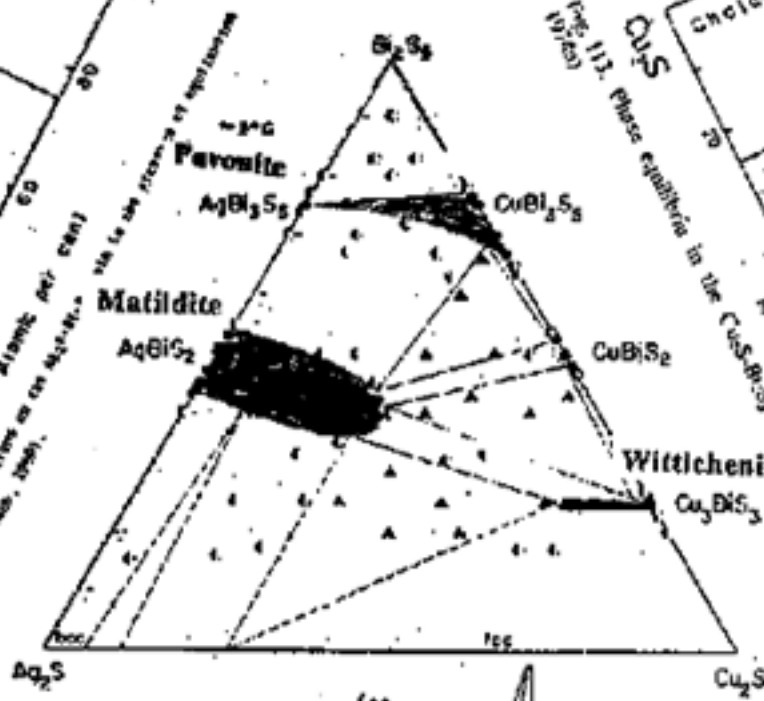
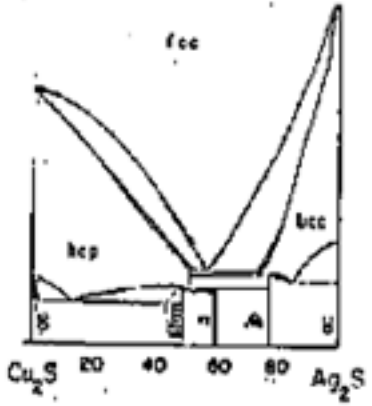
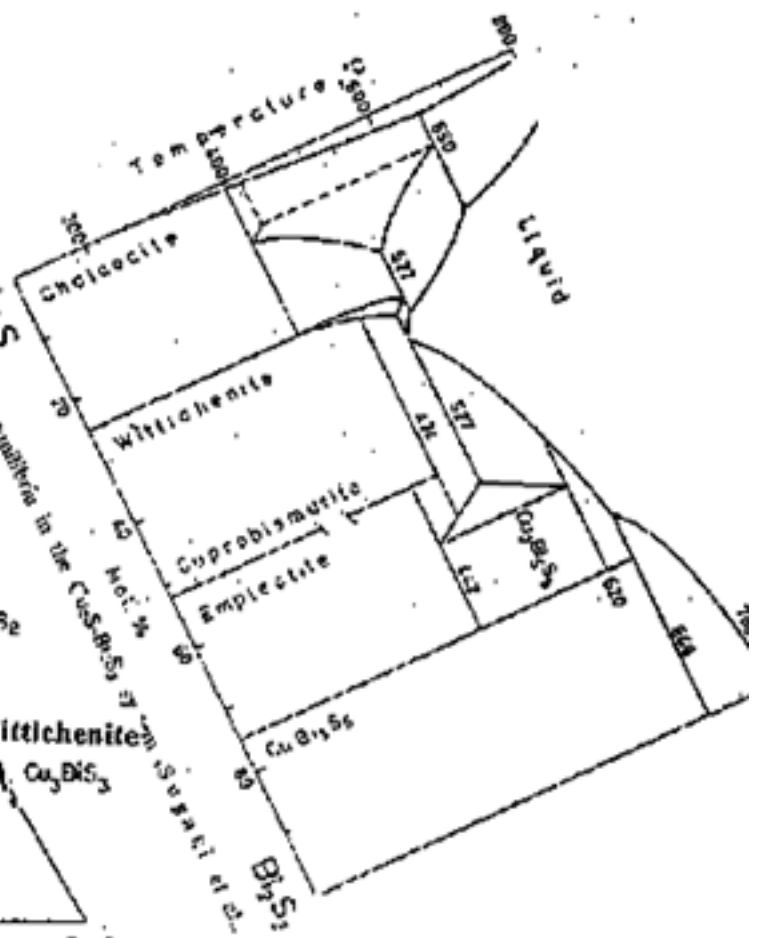
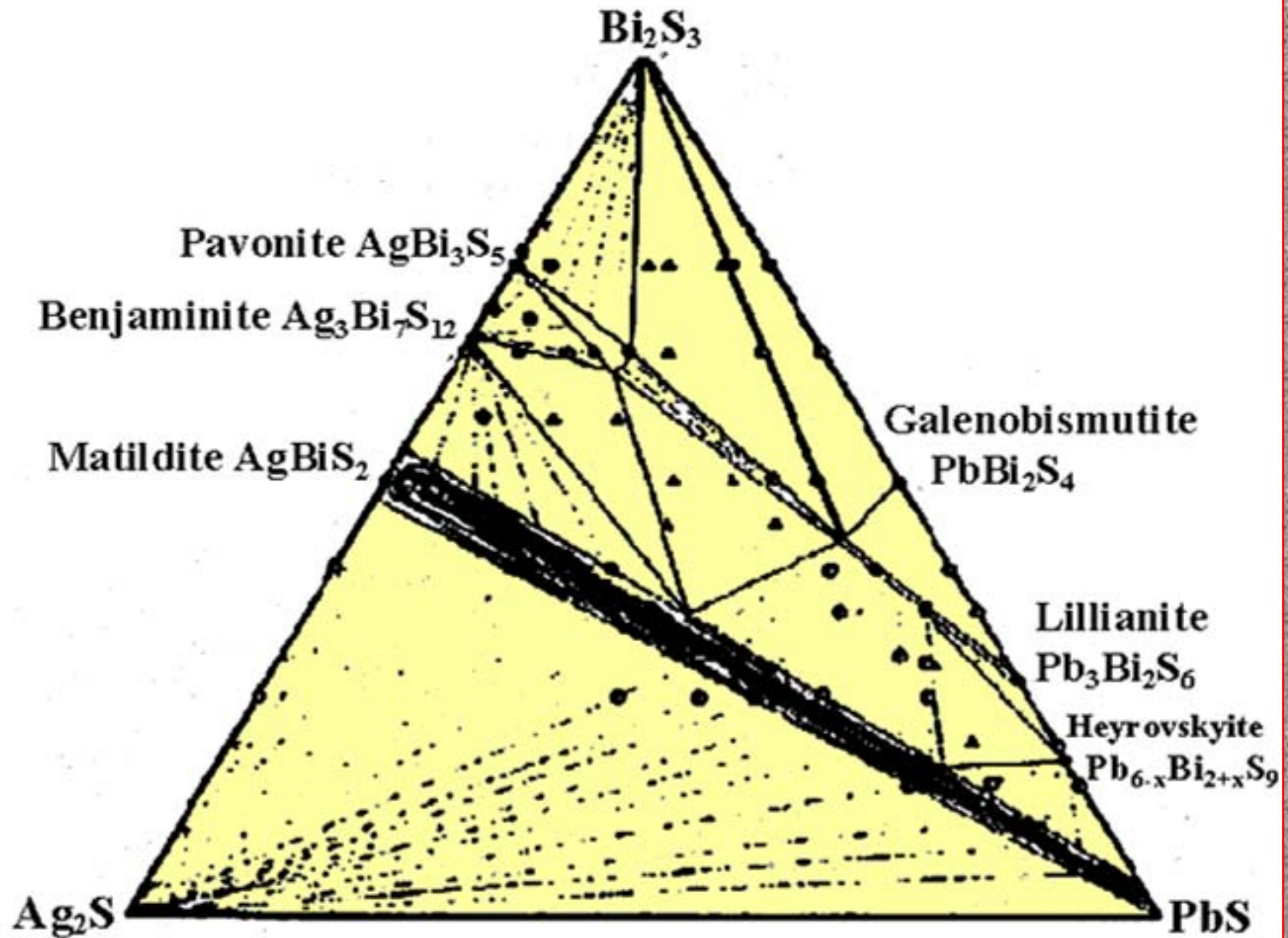
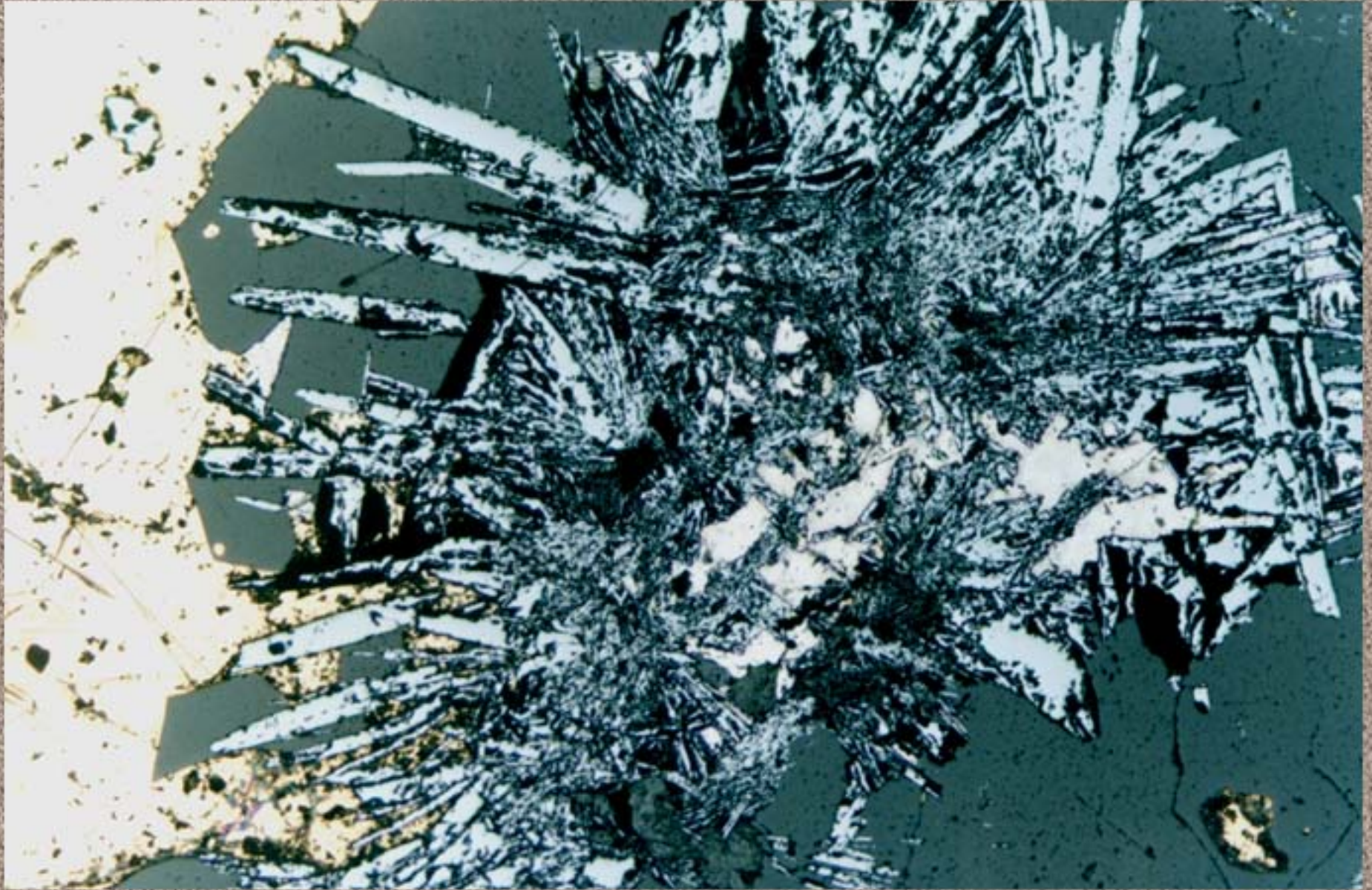
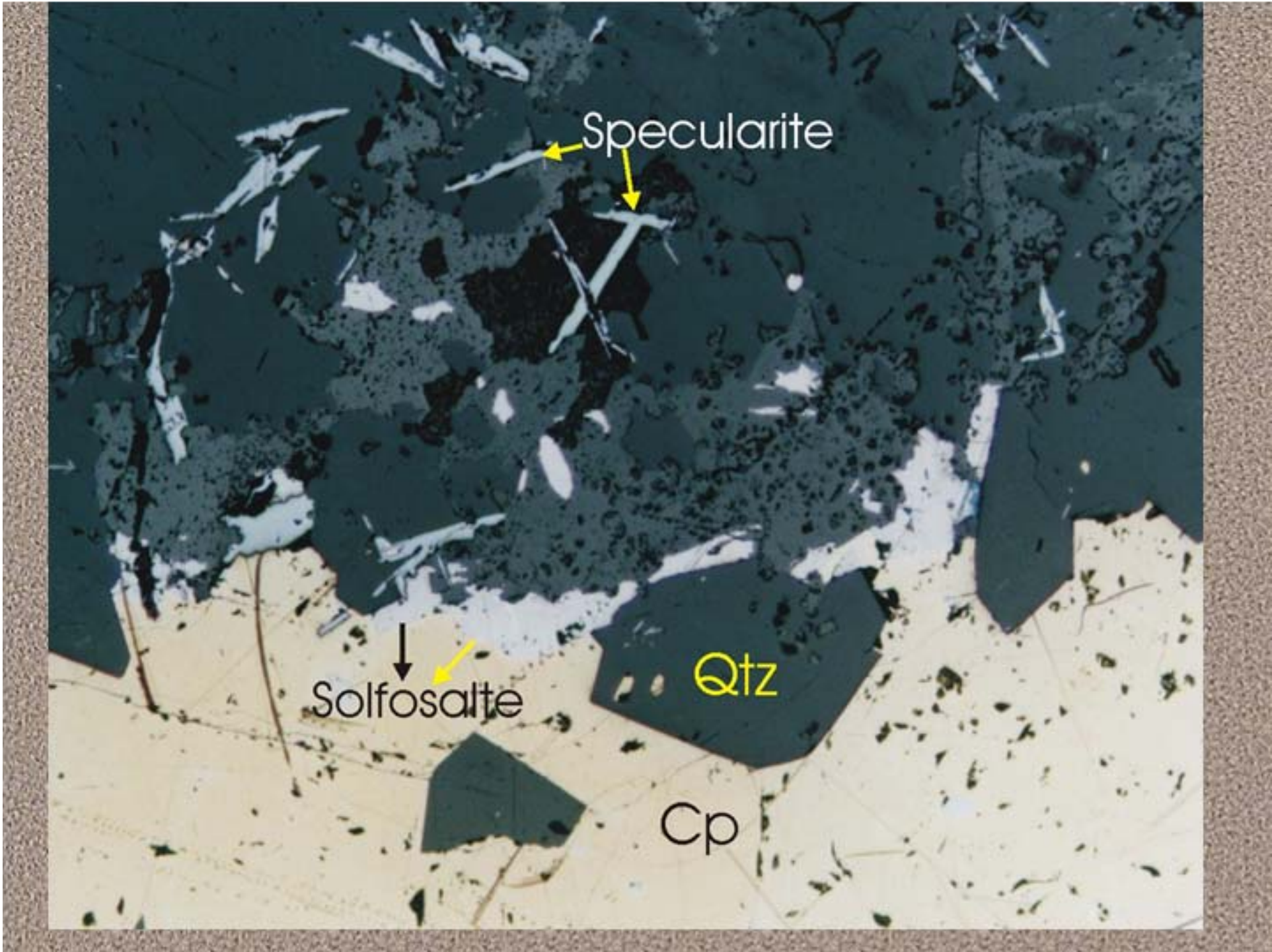


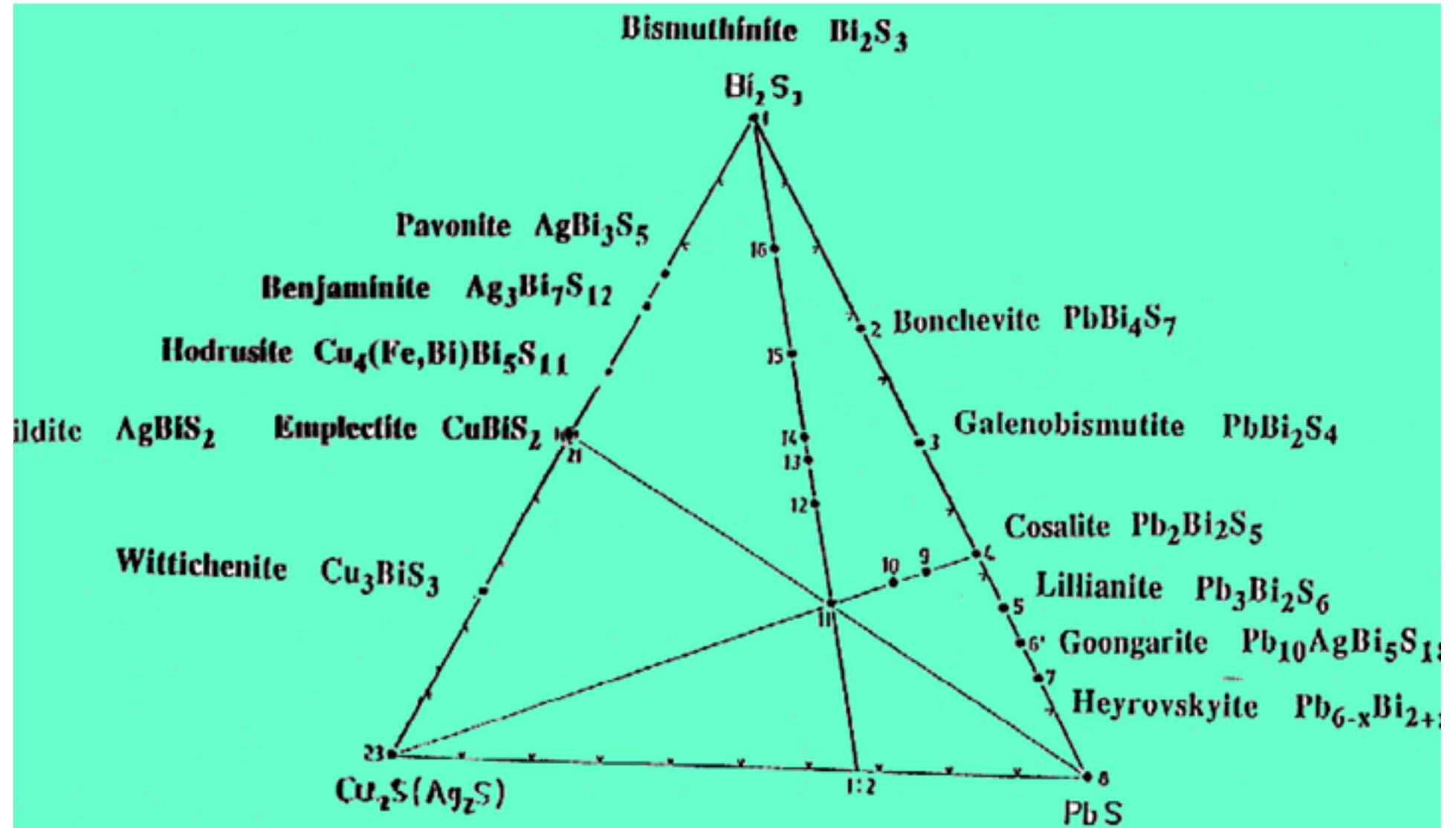
Fig. 11. Phase equilibria in the $\text{Cu}_2\text{S}-\text{Bi}_2\text{S}_3$ system (after G. M. Sturges et al., 1958).











(16) Pekoite $\text{CuPbBi}_{11}\text{S}_{18}$

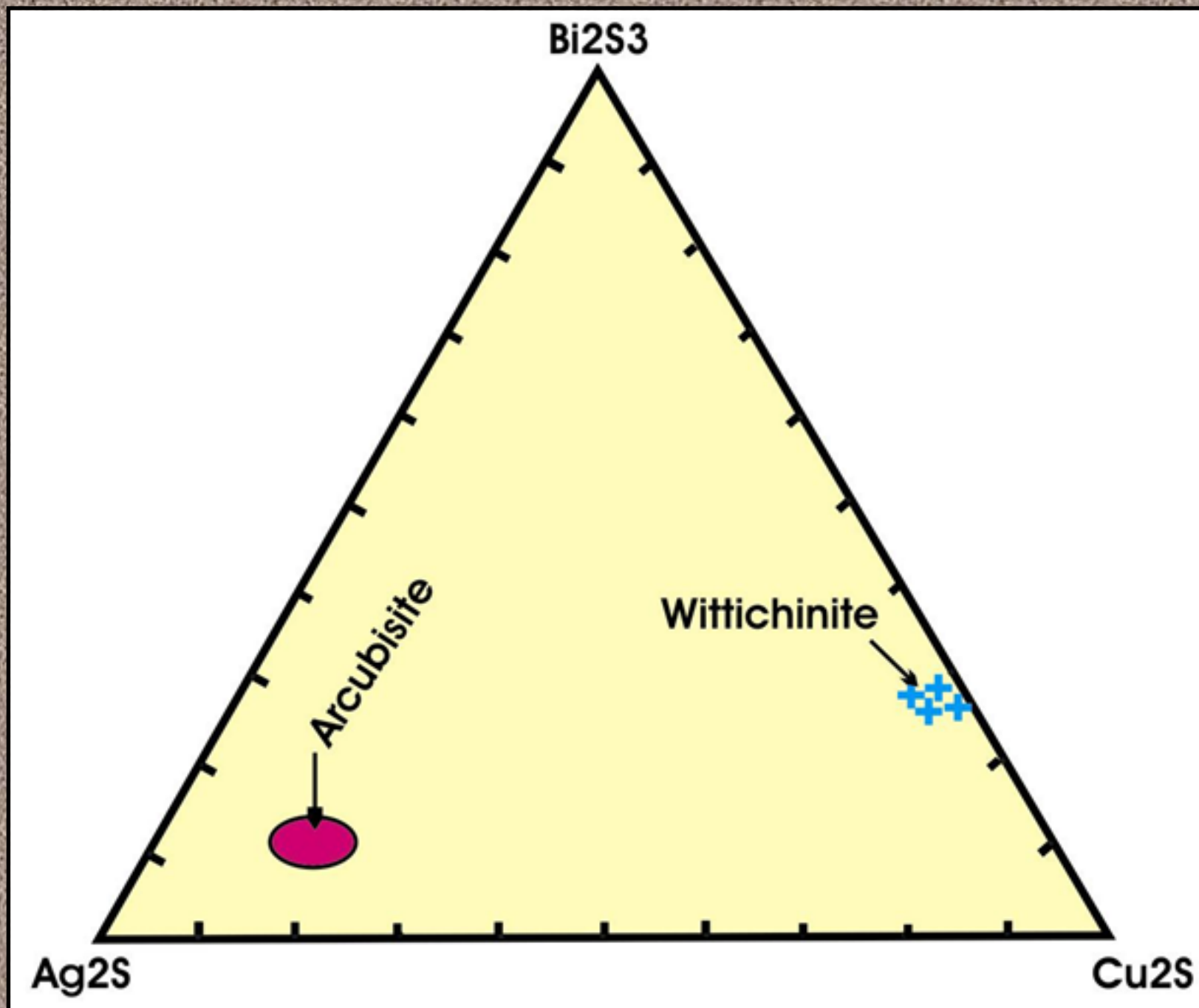
(13) Lindstromite $\text{Cu}_3\text{Pb}_3\text{Bi}_7\text{S}_{15}$

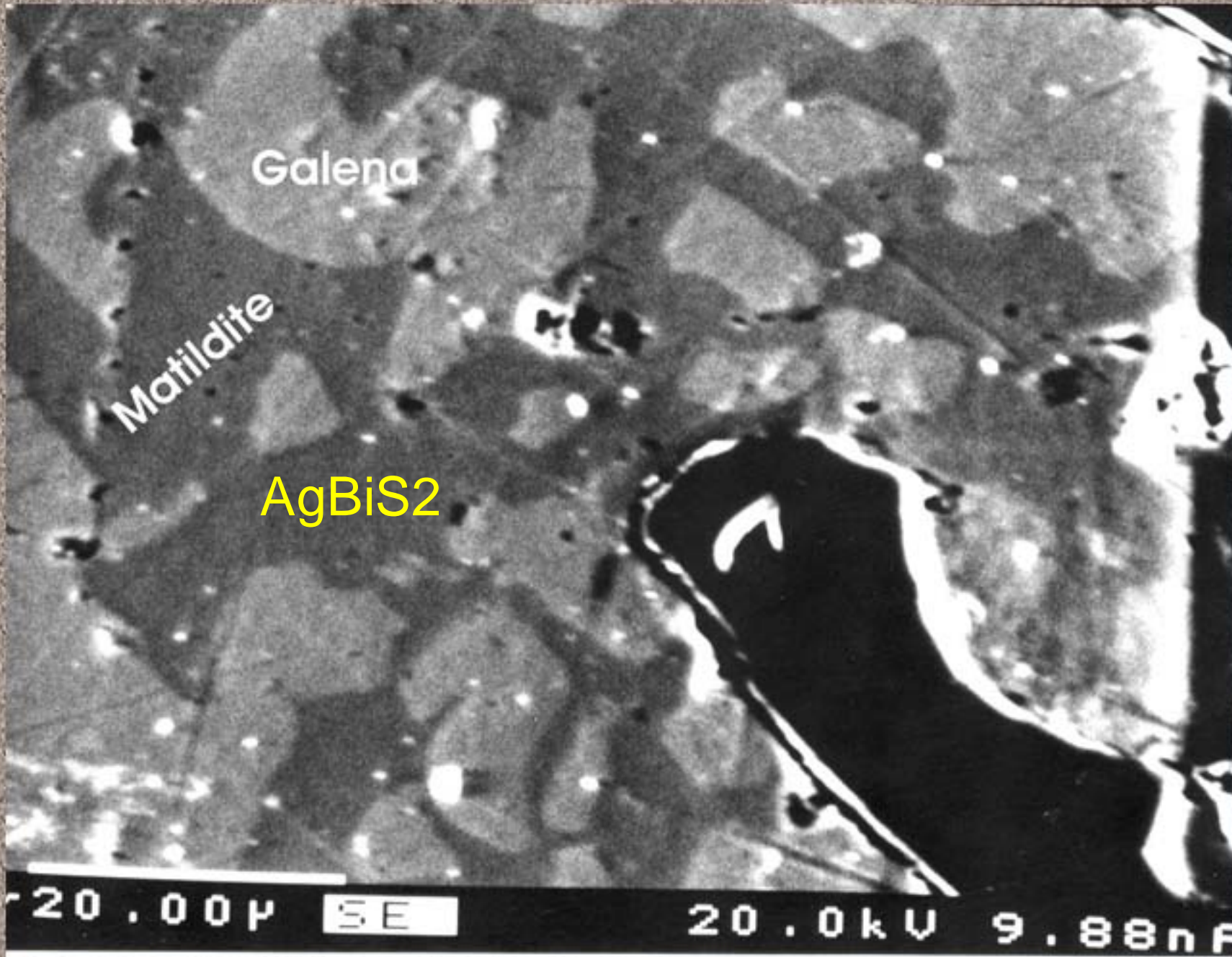
(15) Gladite $\text{CuPbBi}_5\text{S}_9$

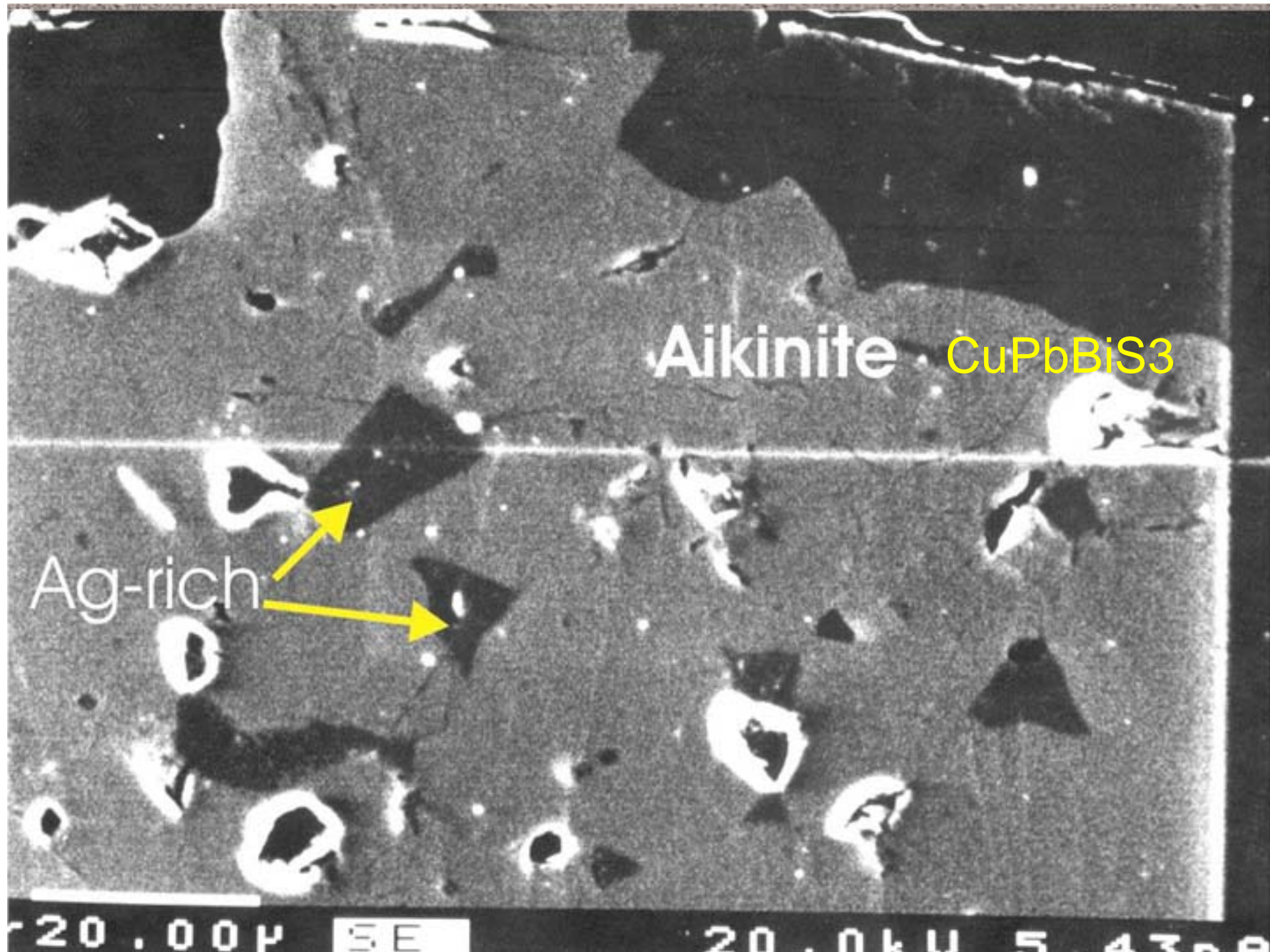
(12) Hammarite $\text{Cu}_2\text{Pb}_2\text{Bi}_{14}\text{S}_9$

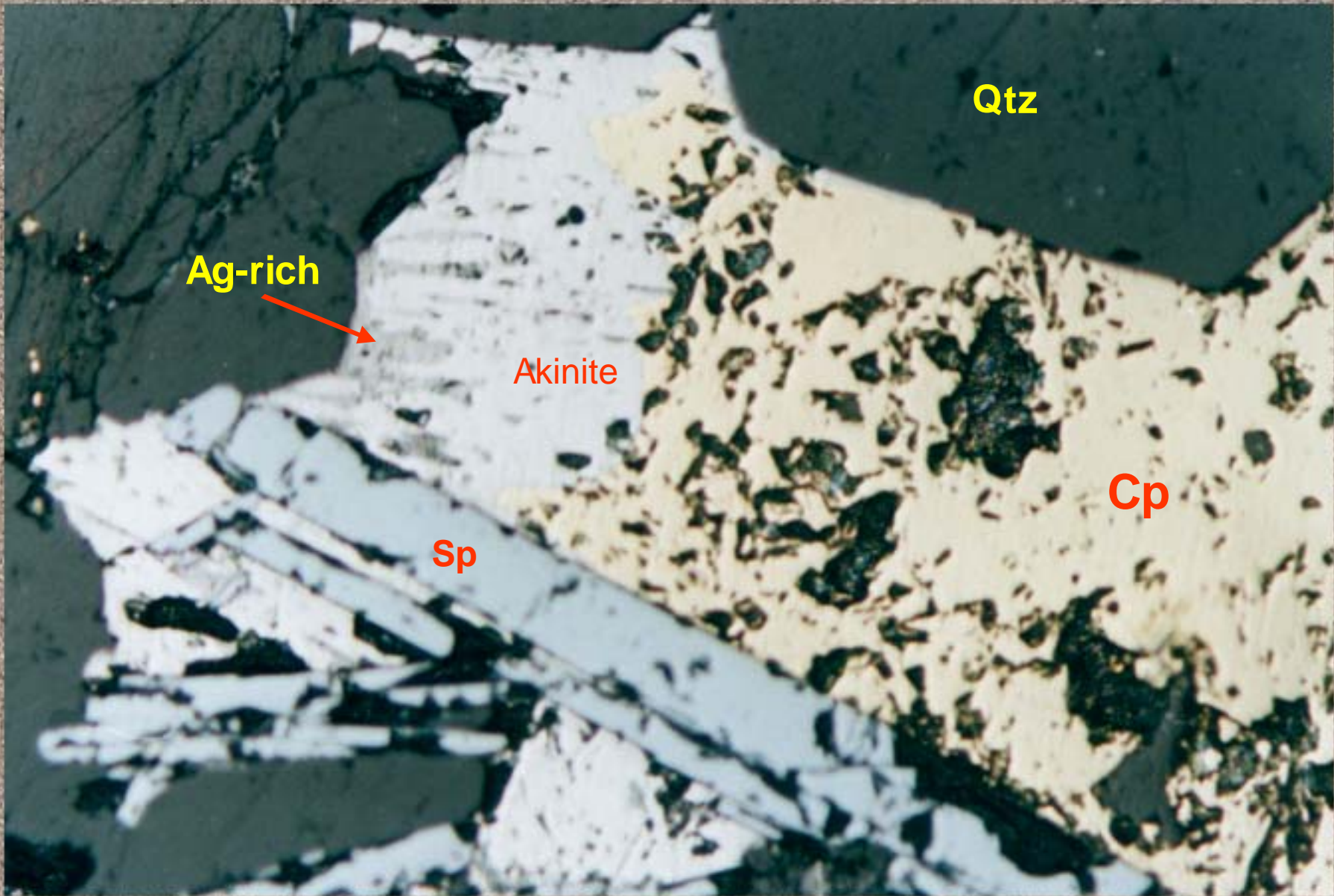
(14) Krupkalite $\text{CuPbBi}_3\text{S}_6$

(11) Akinite CuPbBiS_3



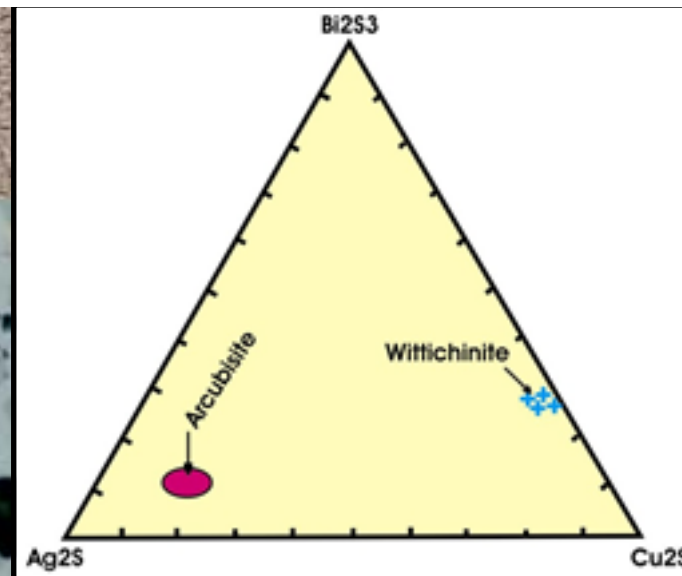








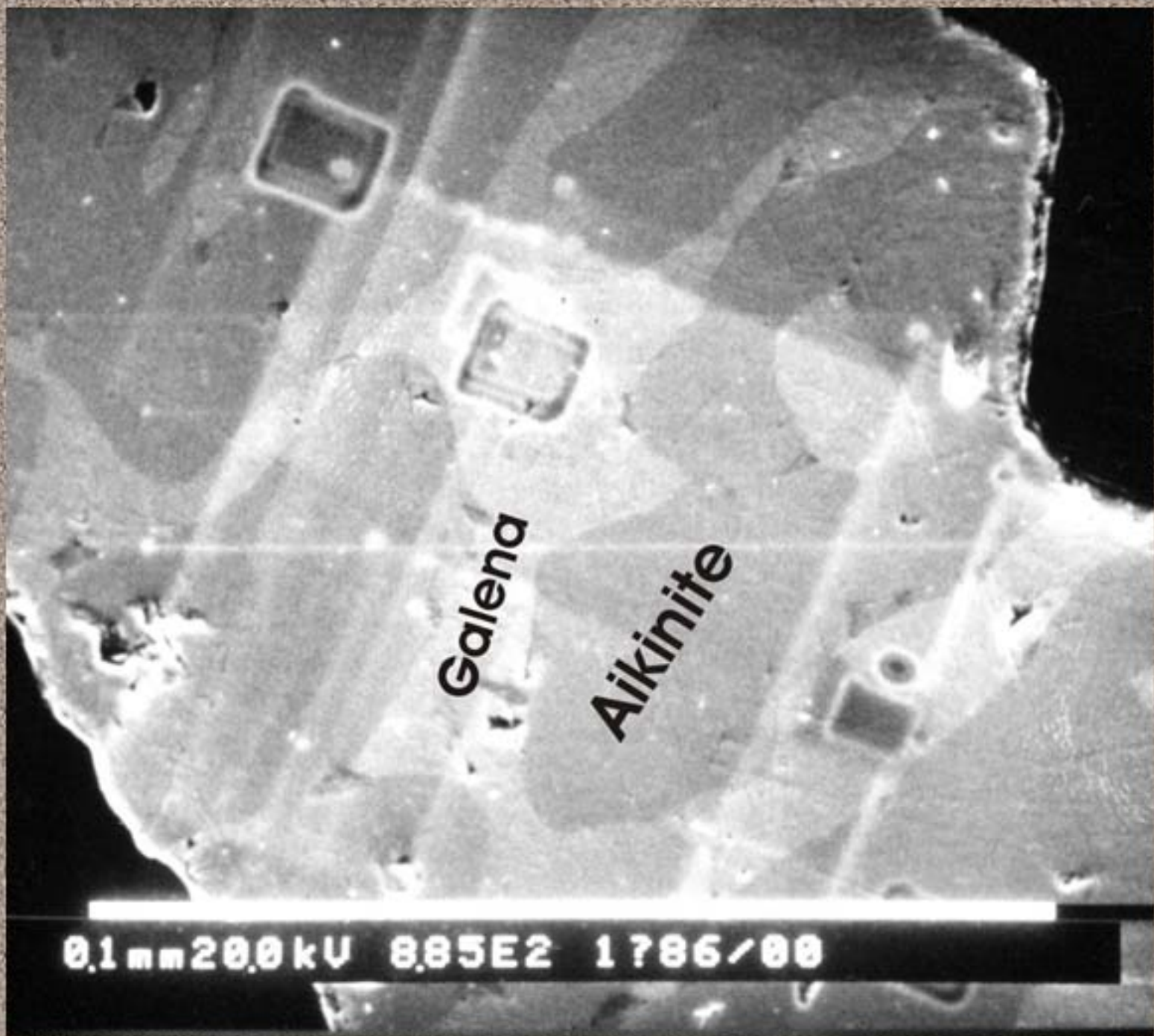
wittichinite = Cu_3BiS_3



Py

Galena





Galena

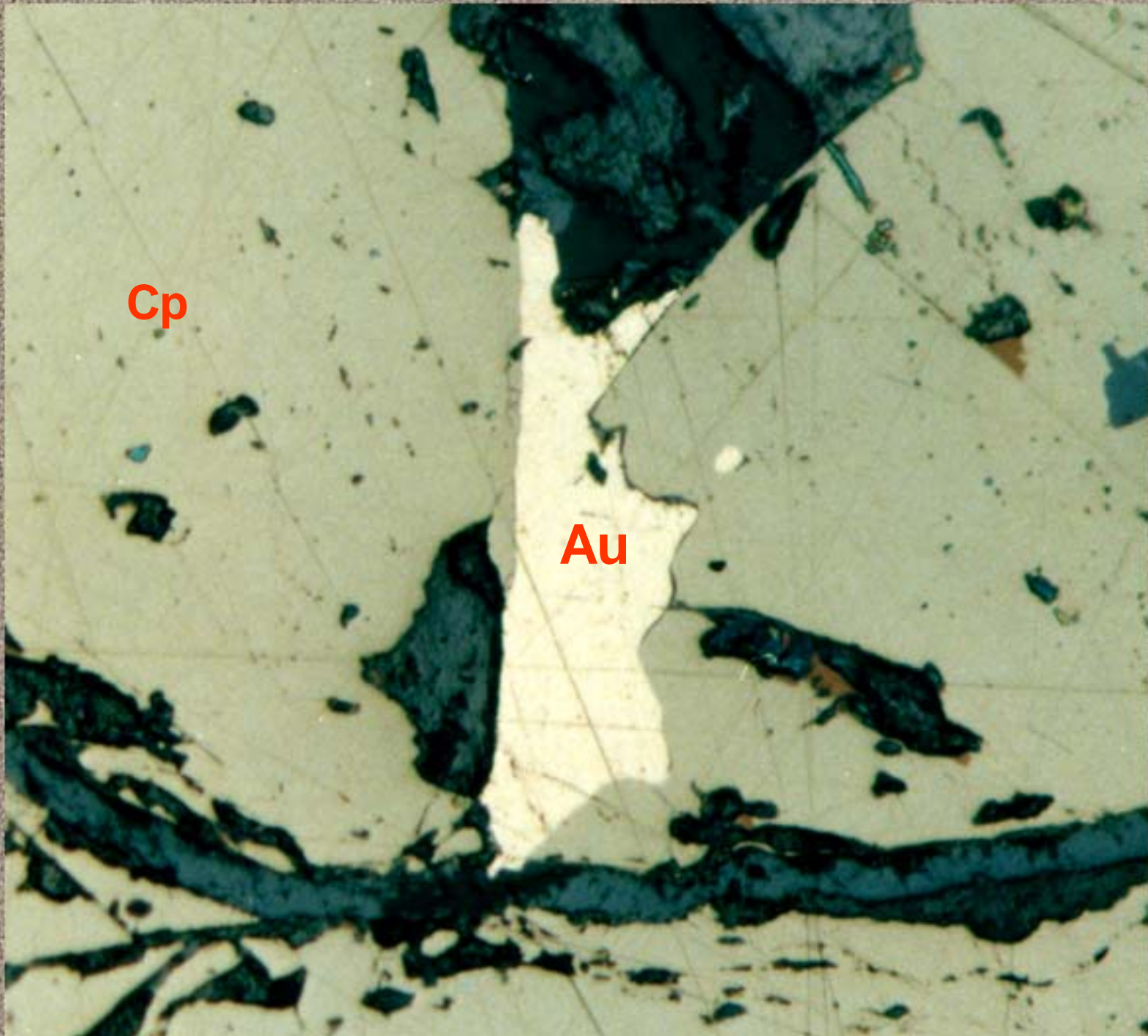
Aikinite

0.1mm20.0kV 8.85E2 1786/00

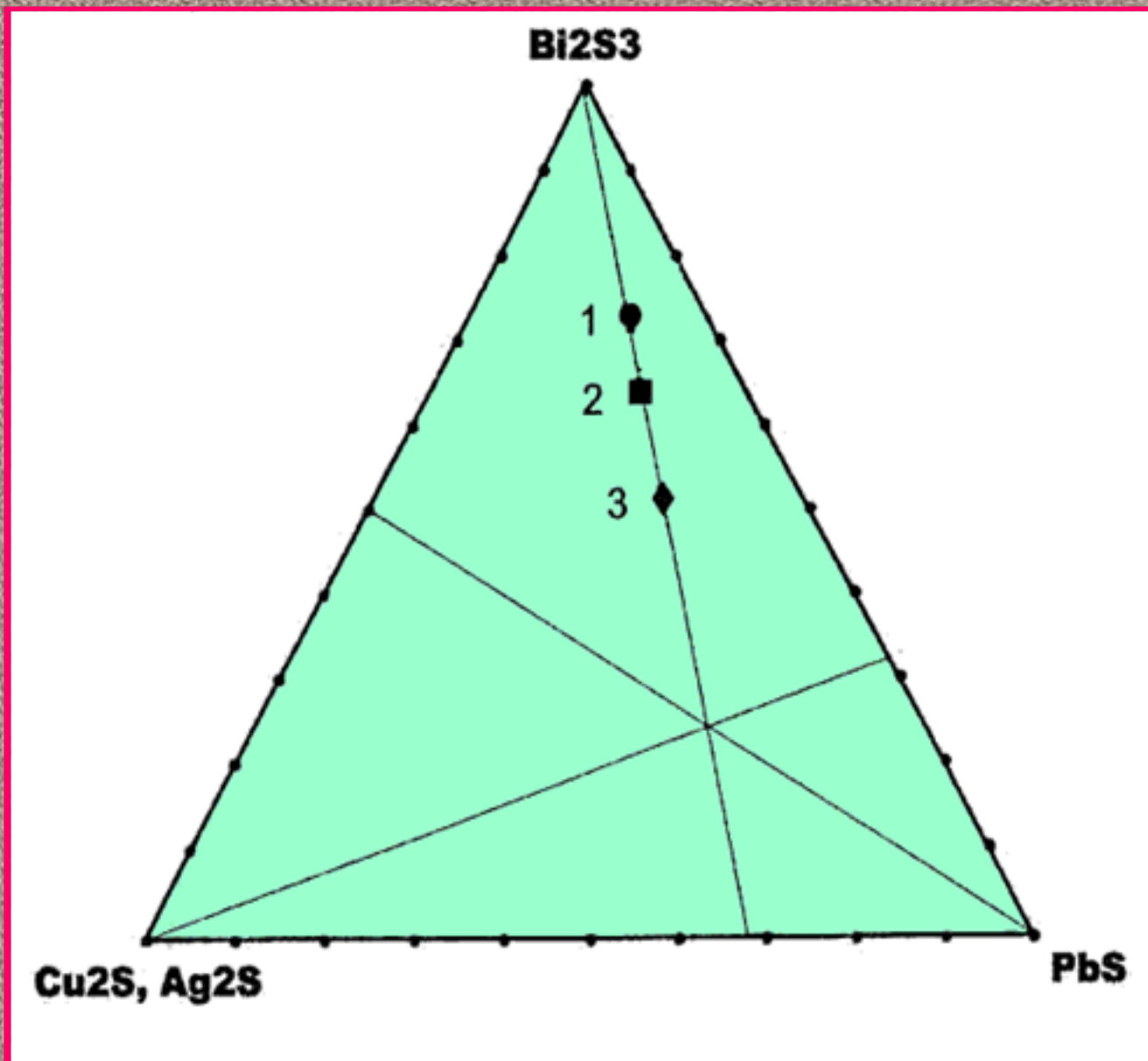


Cp

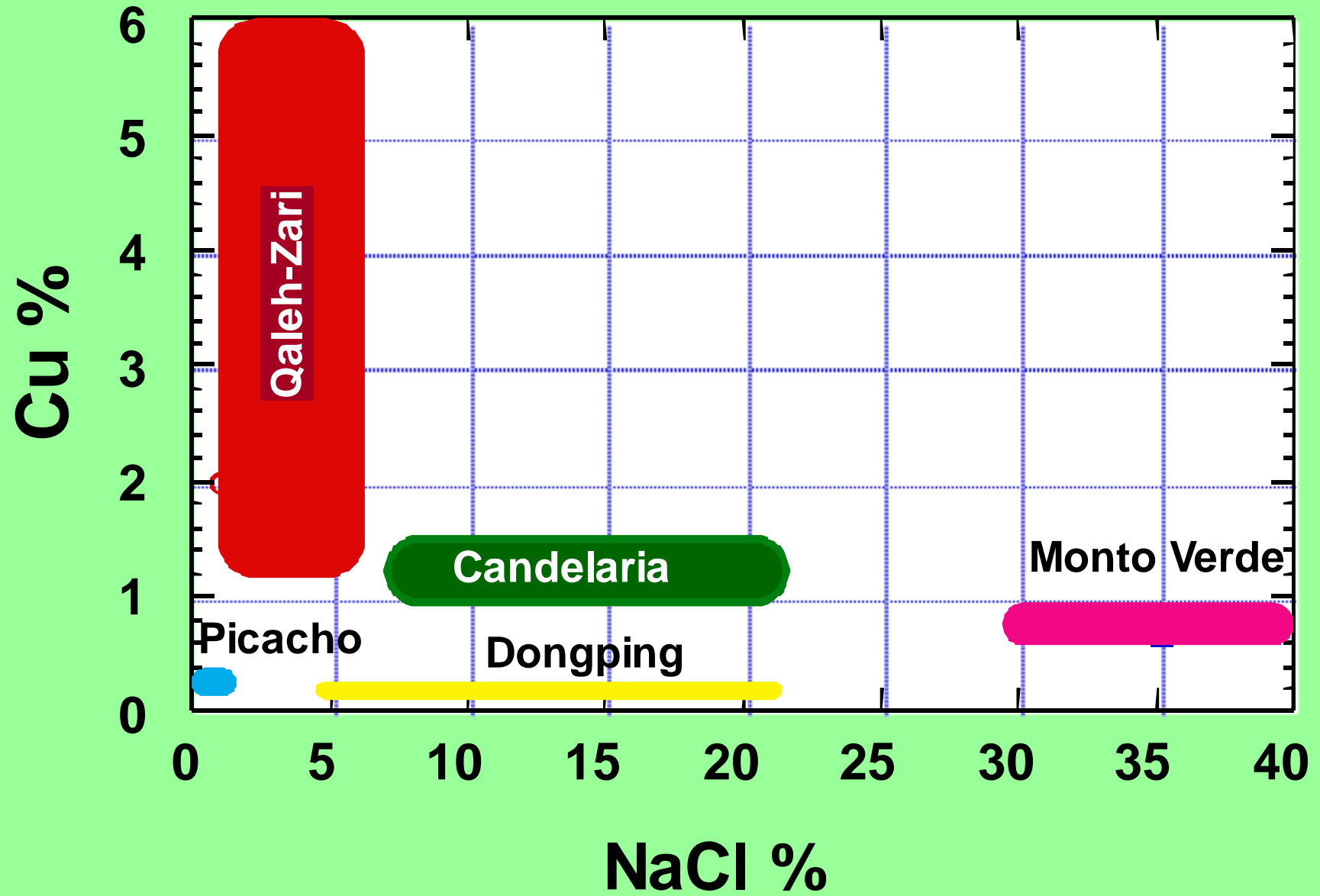
Au



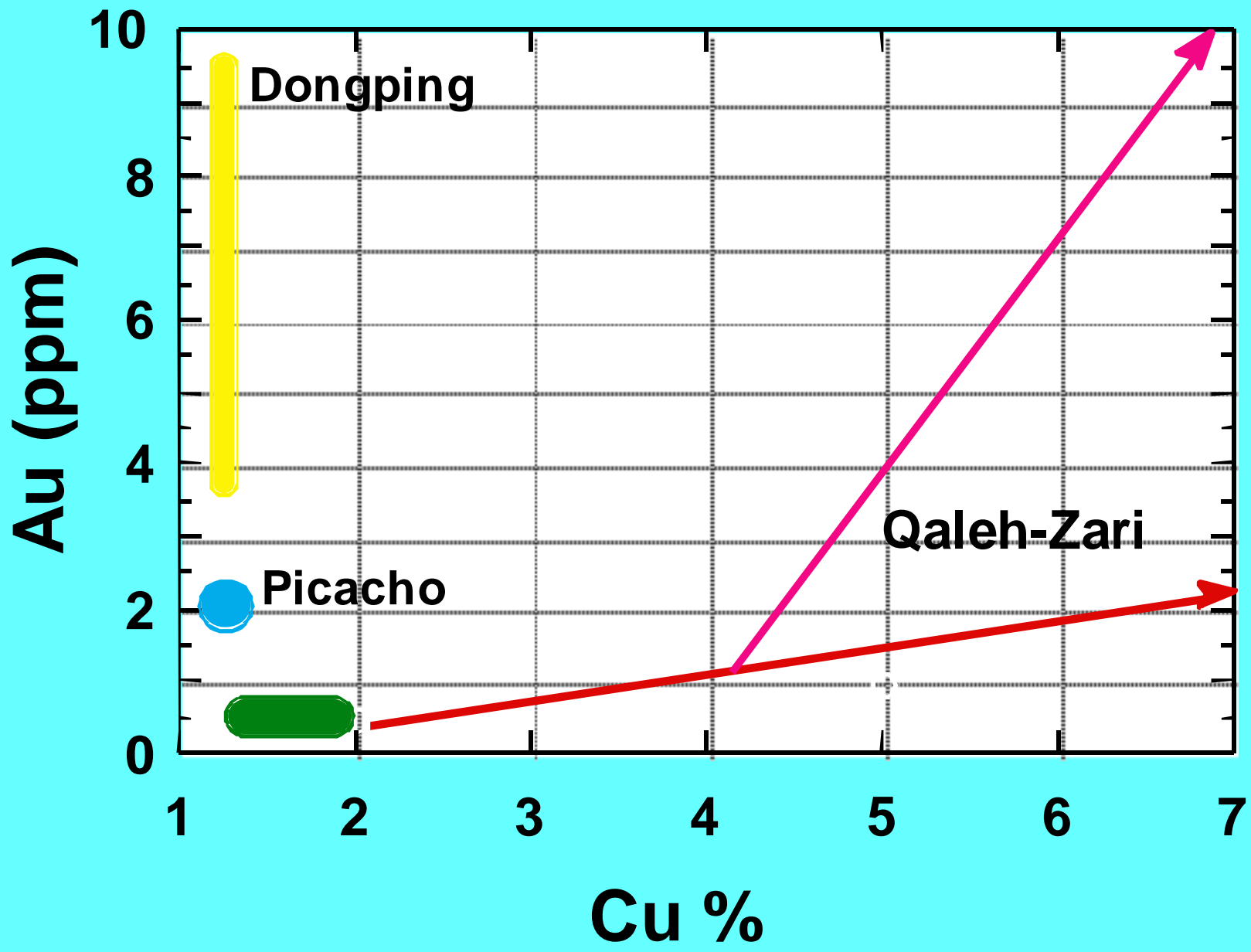
Bismuthinite-aikinite series

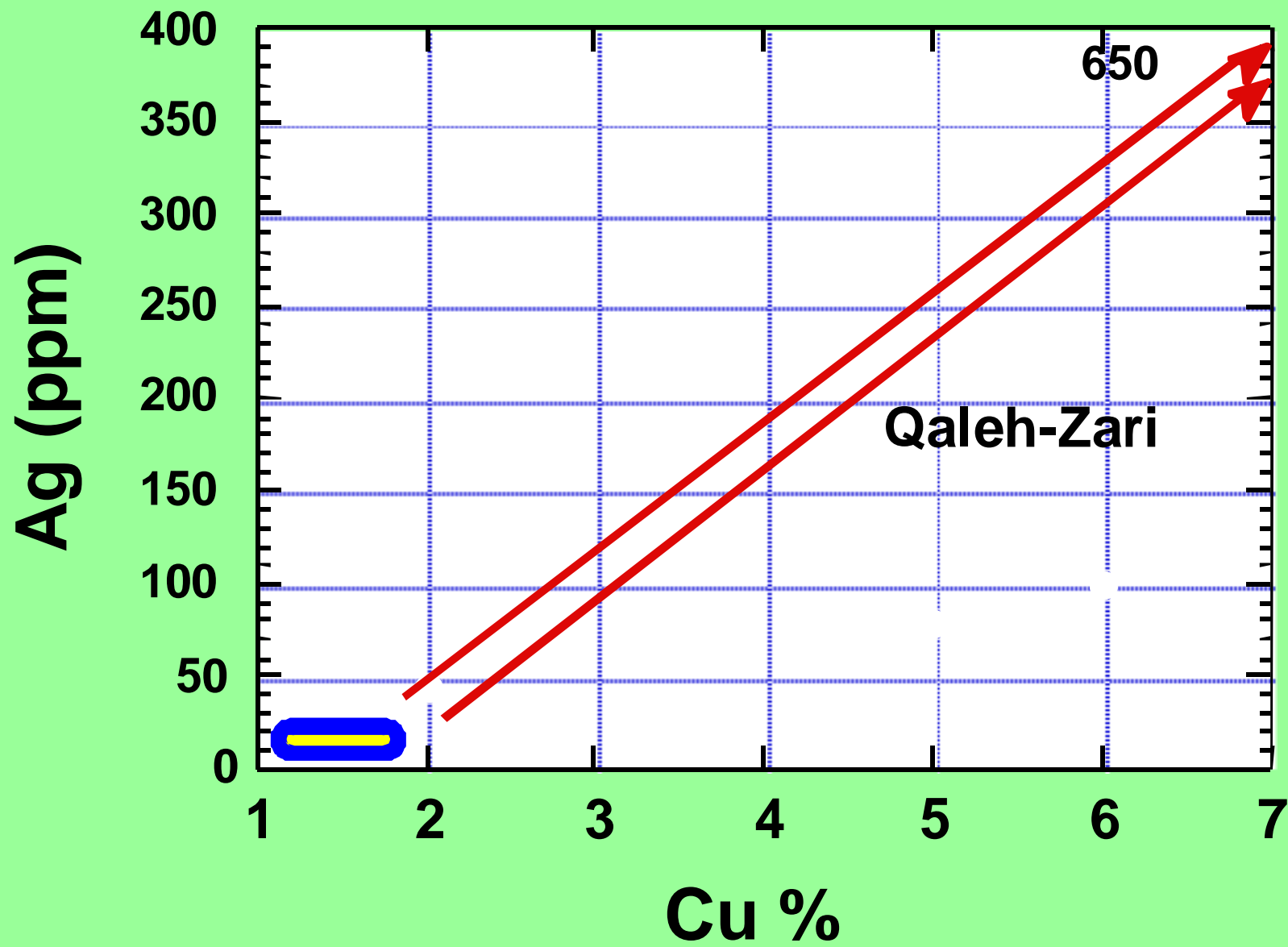


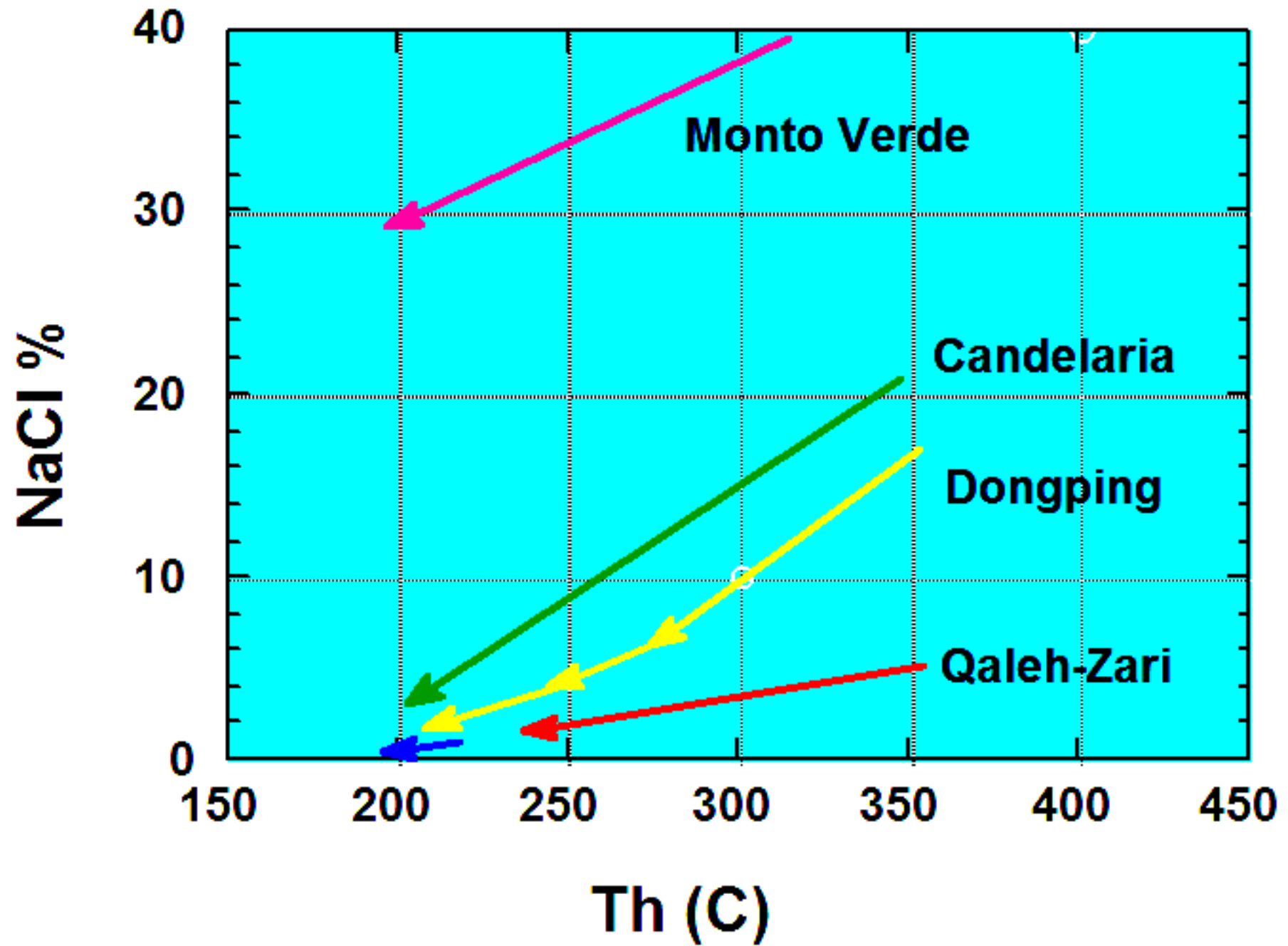
**Comparison of Qaleh-
Zari with
Fe-Oxides Cu-Au
Deposits**

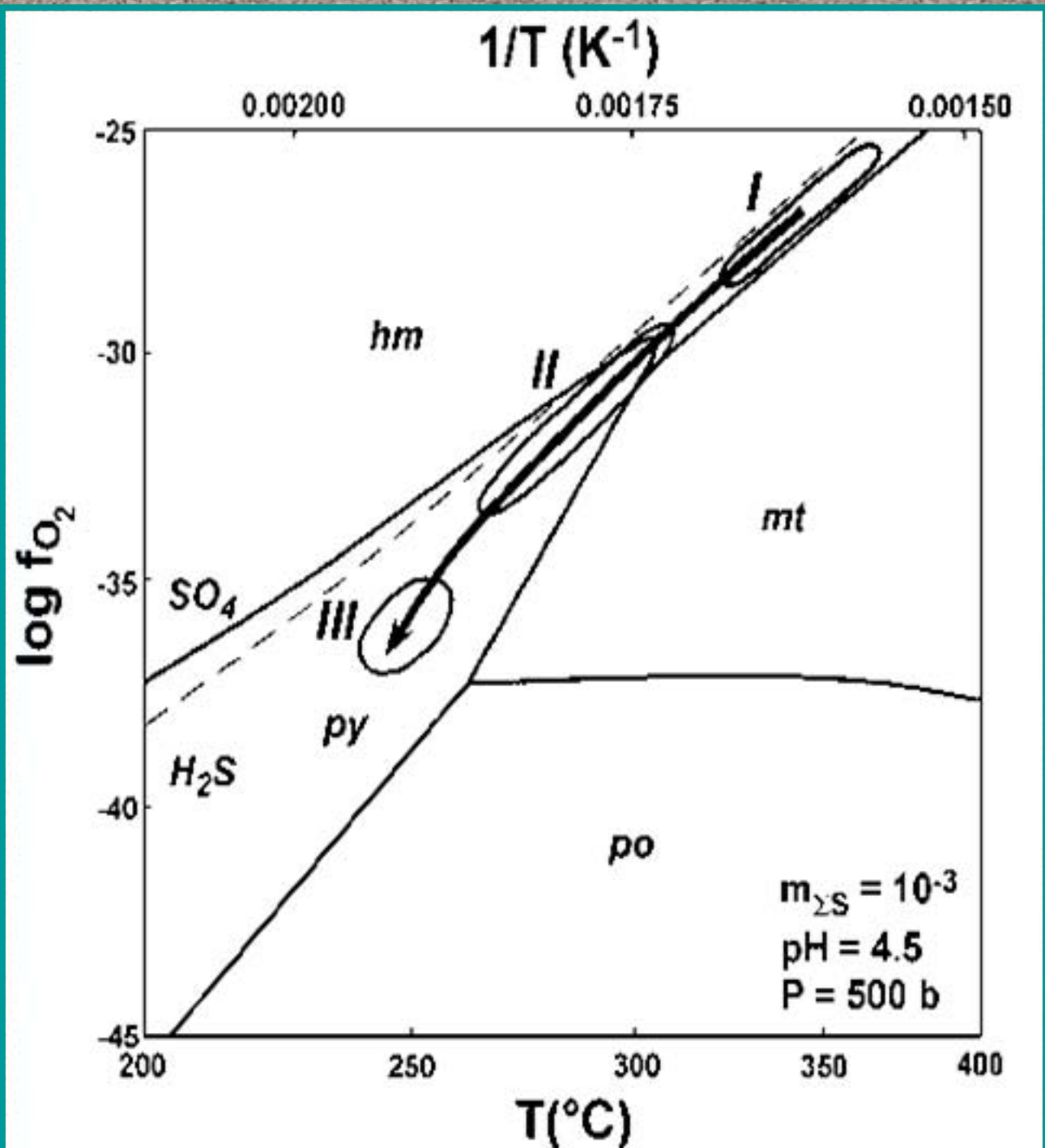


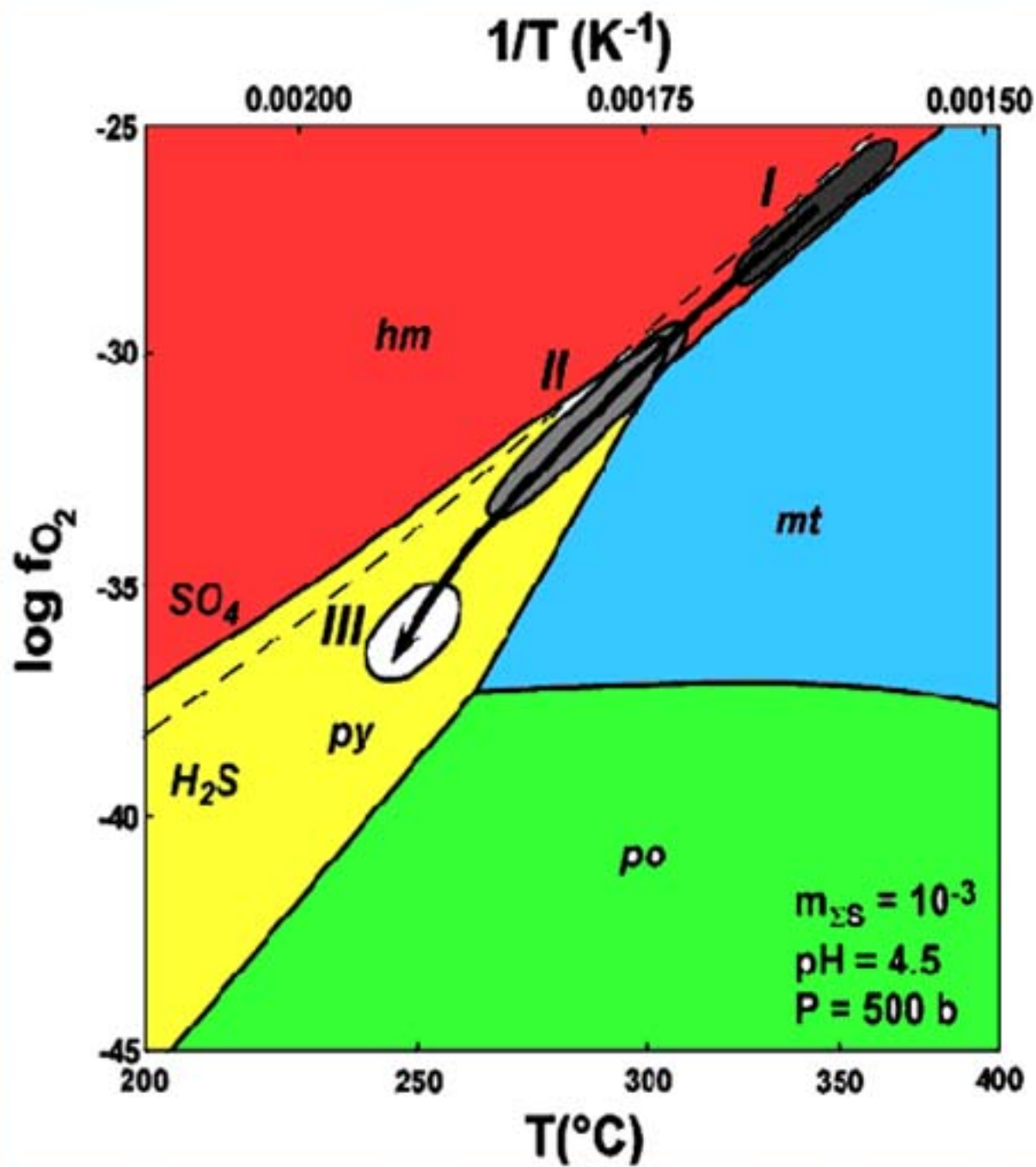
Candelaria, Monto Verde



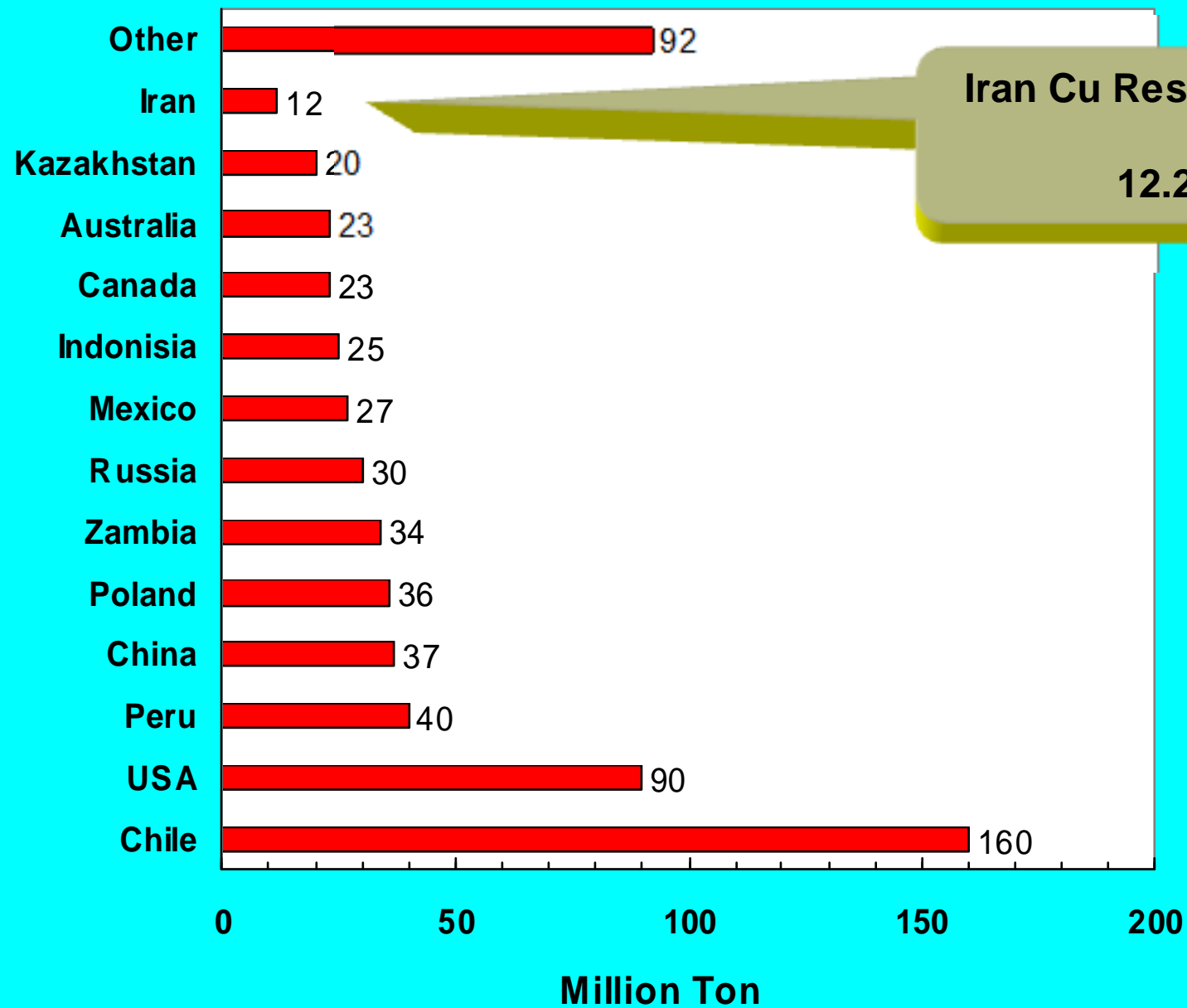








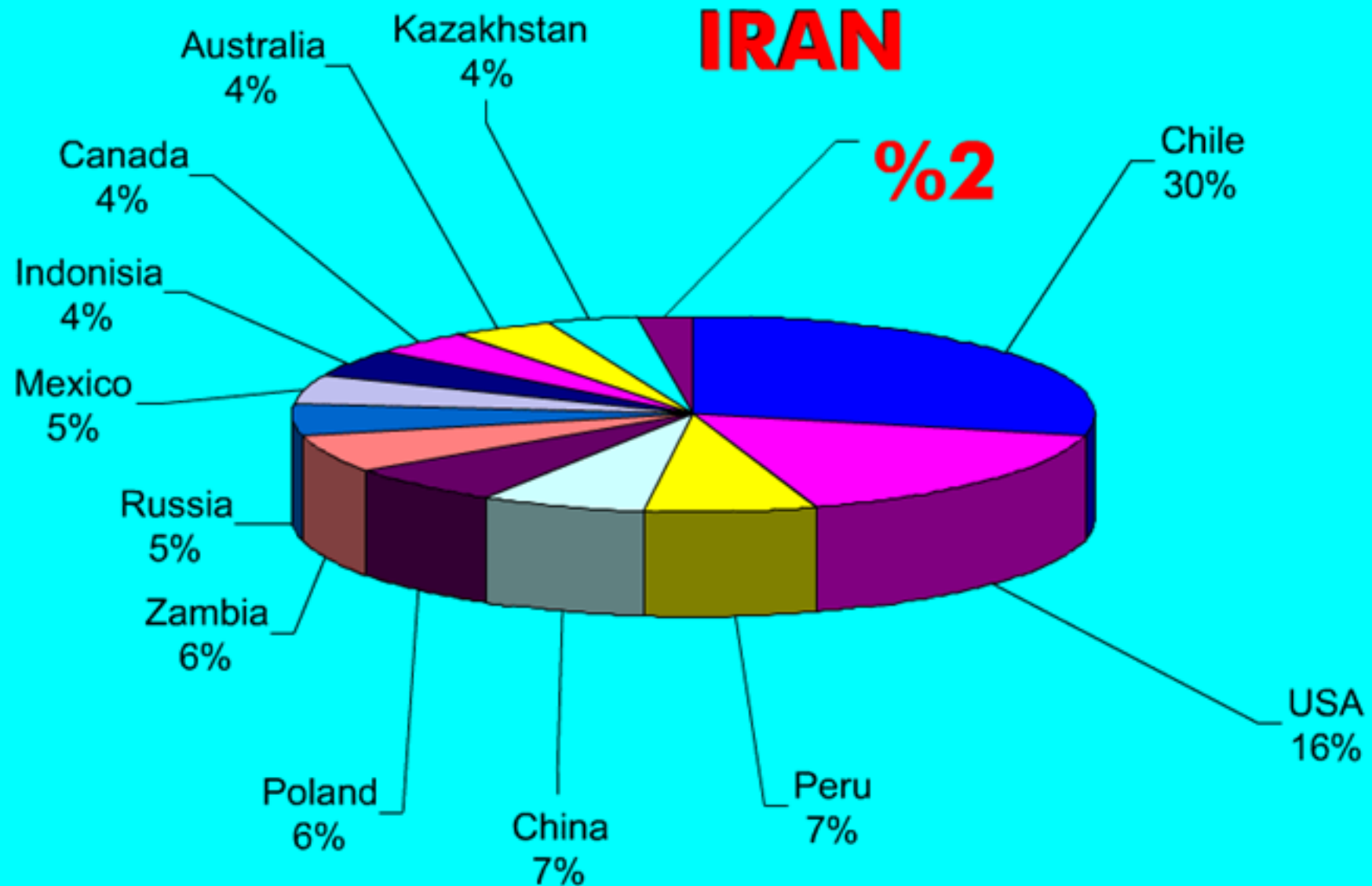
Copper (Reserves, Metal)



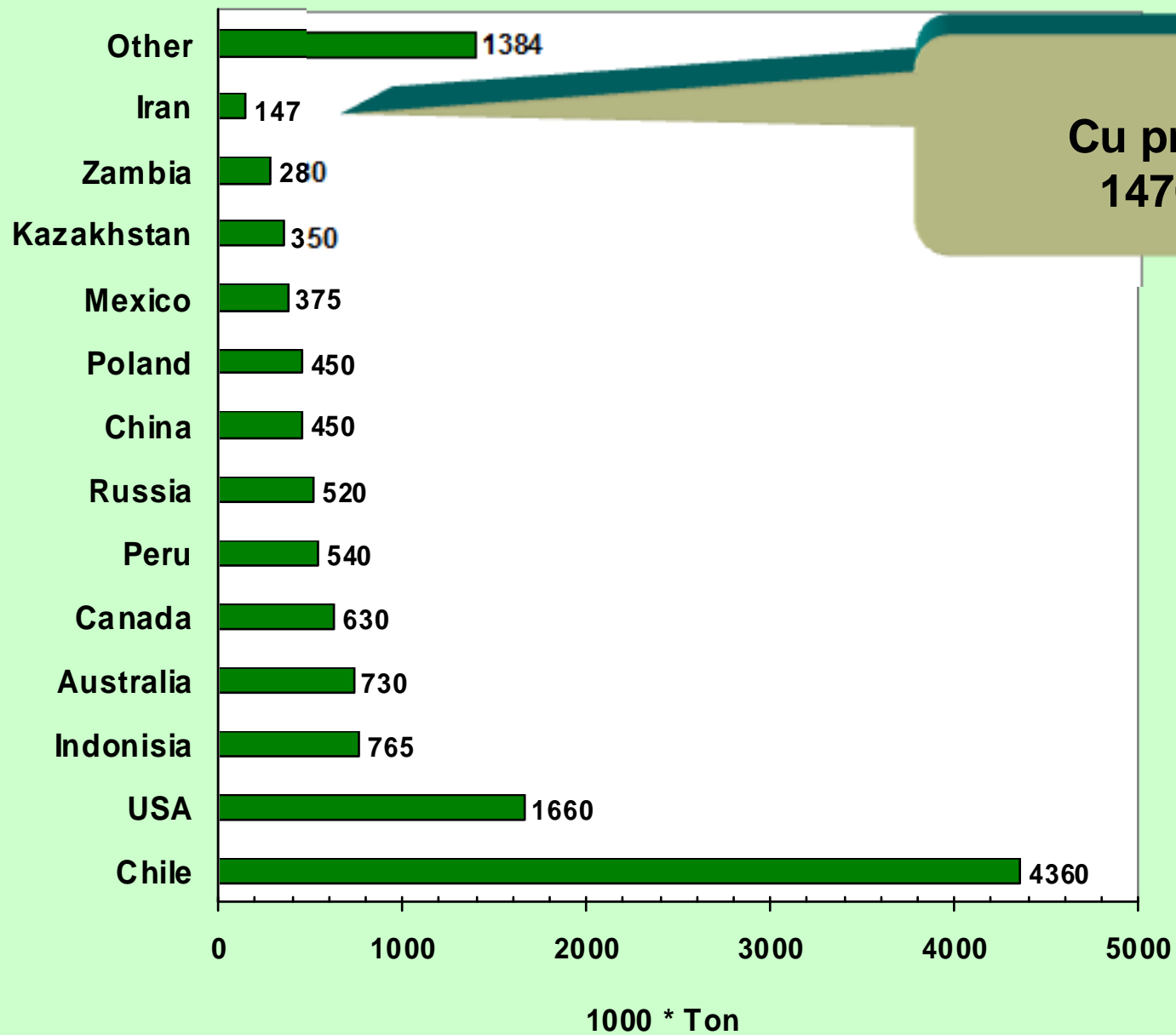
Iran Cu Reserve (metal)

12.2 MT

Copper (Reserves)



Copper (Production)



Iran
Cu production
147000 Ton

Copper (Production)

