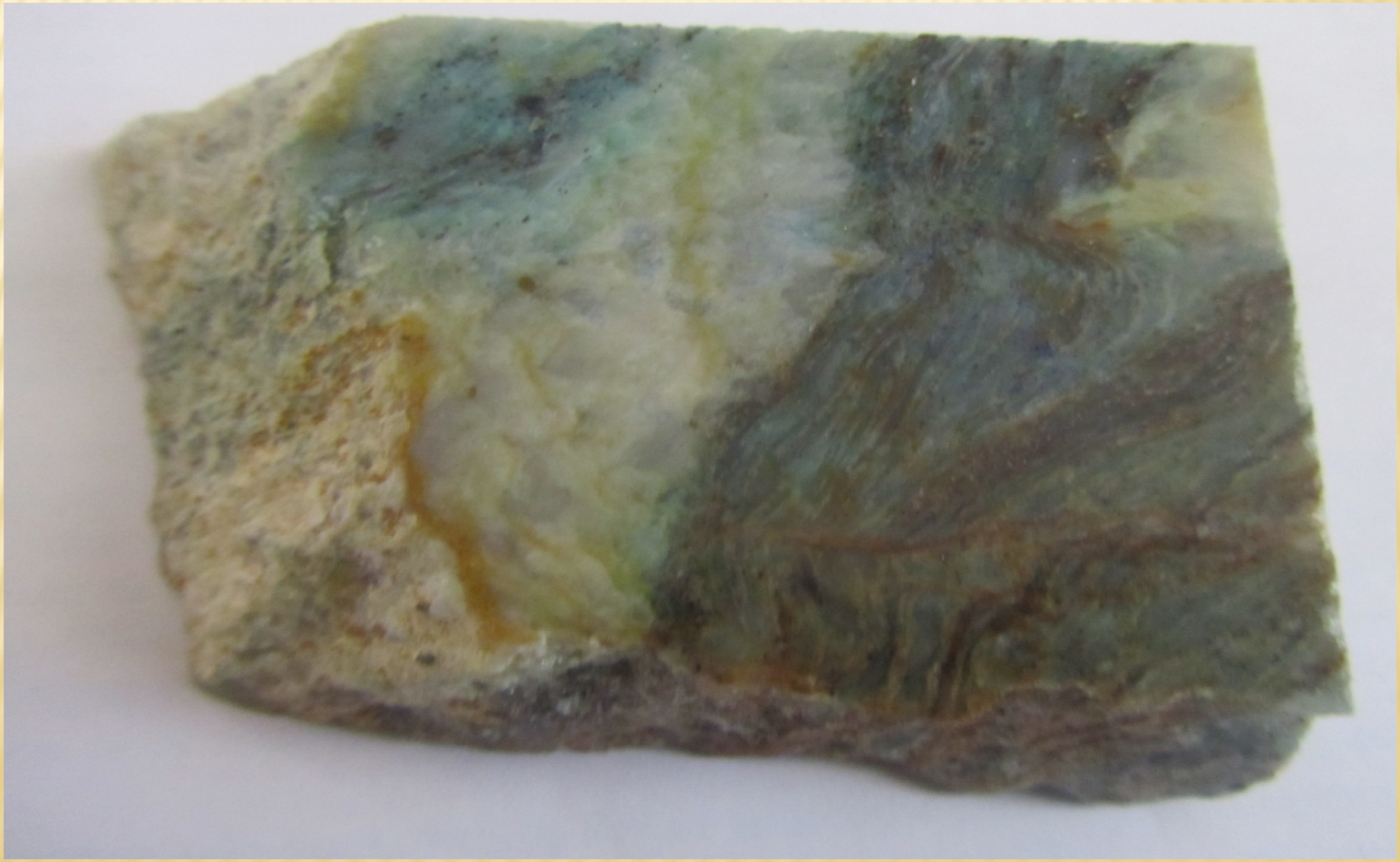
Analysis of An Unknown Brazil Rock Sample

By Alero Ajogri & David Lukudu

01 May 2012 NDSU Petrology 422



OVERVIEW

- Method
- Hand sample
- X Ray Diffraction
- X Ray Refraction
- SEM
- Result
- Conclusion
- Reference

UNKNOWN ROCK SERVING AS DINING TABLE

Methods:

Hand sample description

Altered Colors in the Unkown

- Brown
- Green
- Blue

Grain size- Fine grained

Specific Gravity : 2.9

Hardness : 8 – 9 Scratches glass very easily.

X-RAY DIFFRACTION

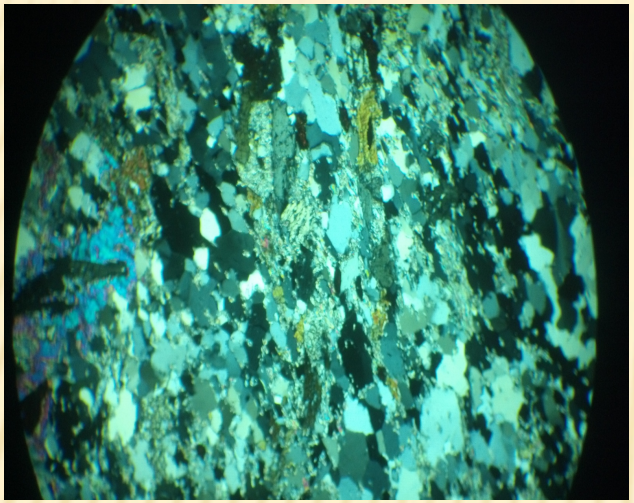
- PREPARATION

- Crushed sample
- Separate Phenocryst
- Powdered
- Run the XRD
- Rate minerals

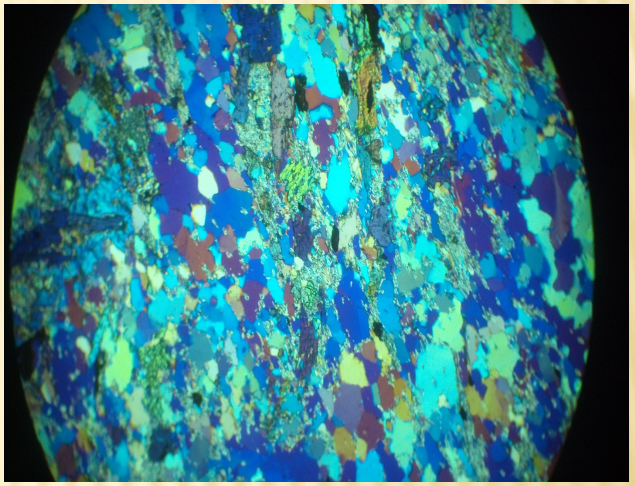
RESULT OF XRF AND AVERAGE ANALYSIS OF THE UNKNOWN ROCK

Sample	BRAZIL
SiO_2 (%)	65.218
Al_2O_3 (%)	16.316
Fe_2O_3 (%)	0.206
CaO (%)	0.074
MgO (%)	0.007
MnO (%)	0.02
Na_2O (%)	1.306
K_2O (%)	1.044
P_2O_5 (%)	0.004
TiO_2 (%)	0.77

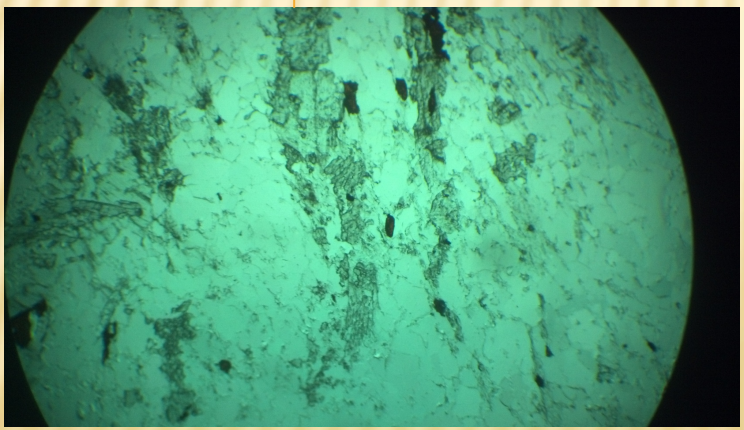
Thin Sections



Scale 5mm



Scale
5mm



Scale 5mm

Minerals found in thin section

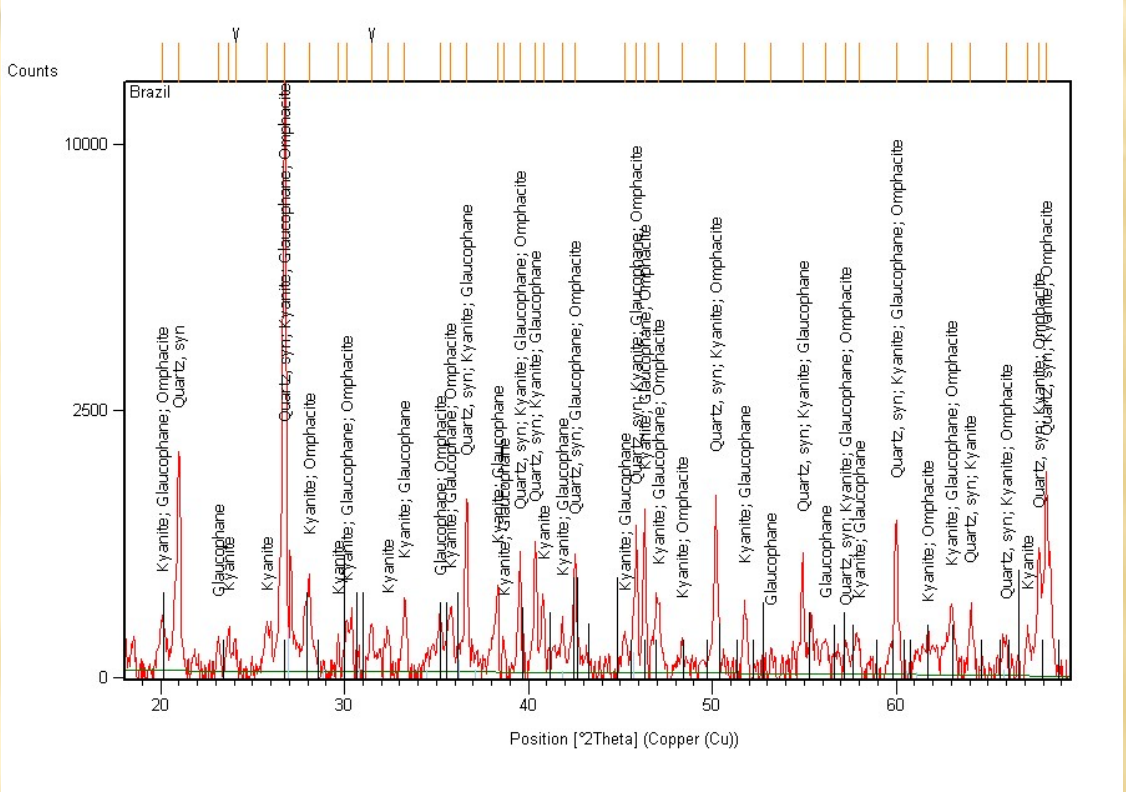
1. Quartz
2. Garnet
3. Pyroxene
4. Albite
5. Glaucophane

X RAY DIFFRATION

Minerals found in

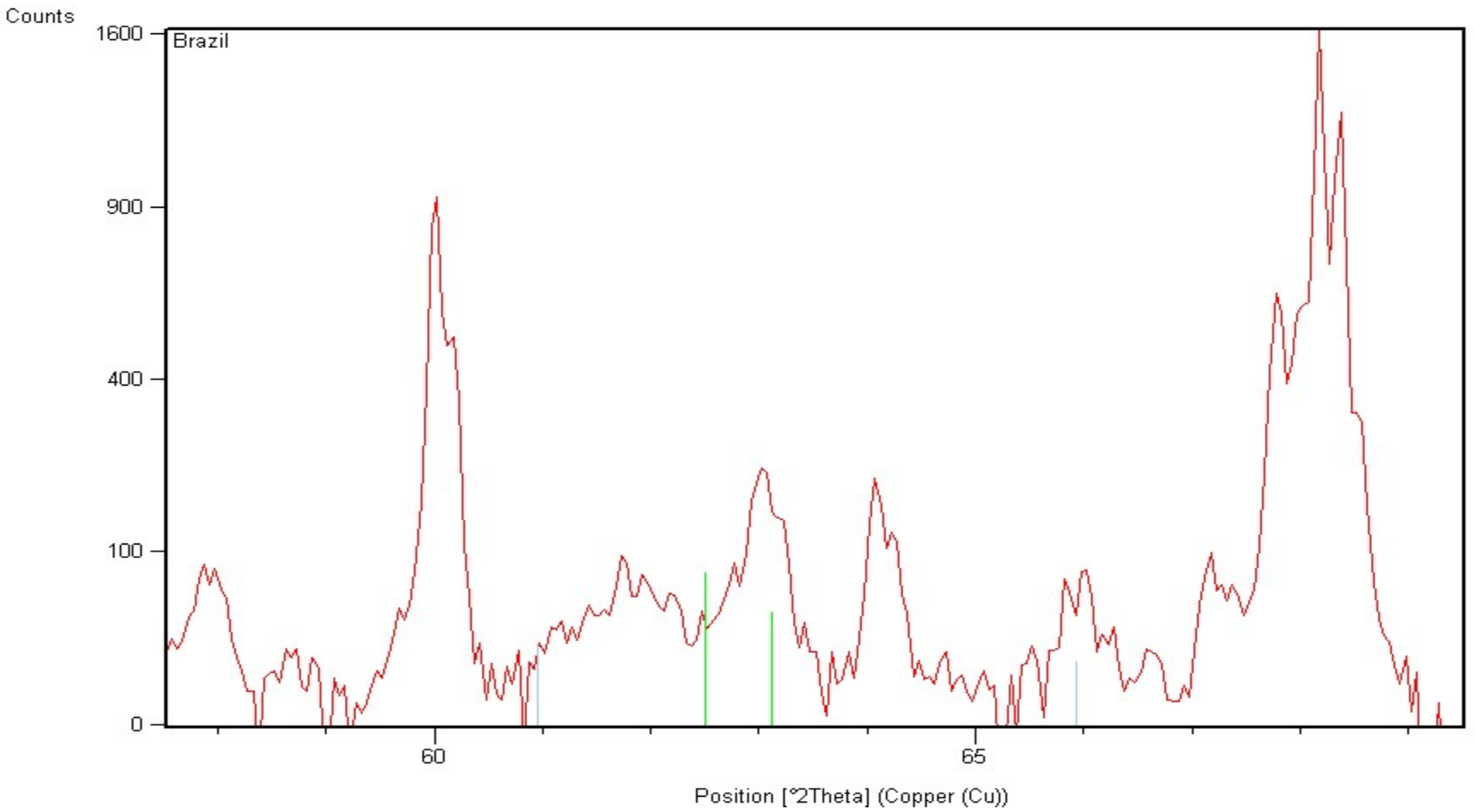
X Rray diffraction

1. Kyanite
2. Omphacite
3. Glaucophane
4. Quartz
5. Paragonite



X-Pert High Score

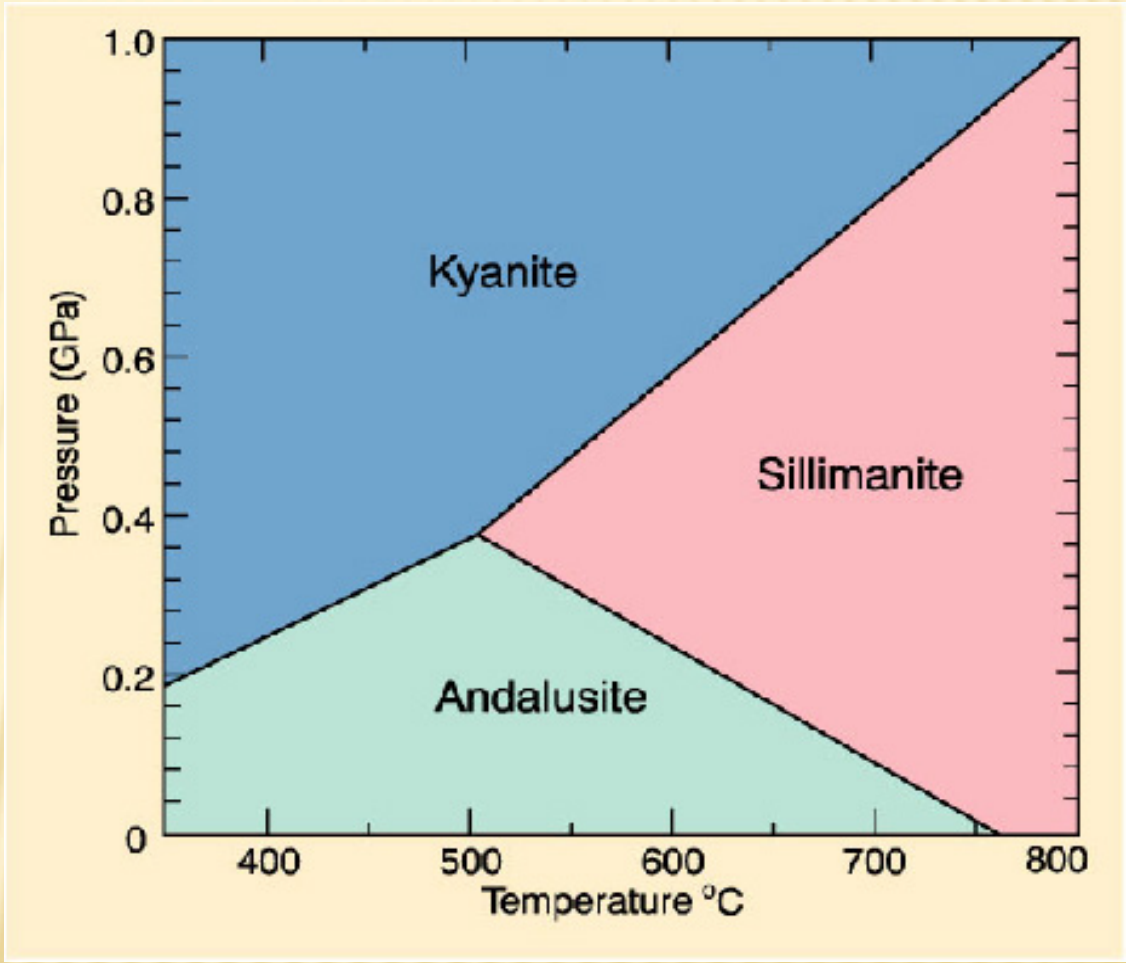
X RAY DIFFRACTION WITH PARAGONITE



X-Pert High Score

CHEMISTRY OF KYANITE

1. Chemical formula Kyanite Al_2SiO_5
2. Stable at high pressure zone.



CHEMISTRY OF QUARTZ

- Chemical formula SiO_2
- Hardness of 7
- Specific density 2.65

CHEMISTRY OF OMPHACITE

- Chemical formula (Ca,Na)(Mg, Al) Si_2O_6
- Hardness of 6-7
- Monoclinic
- Major component of Eclogite
- On a high temperature and pressure zone in the P-T diagram

CHEMISTRY OF PARAGONITE

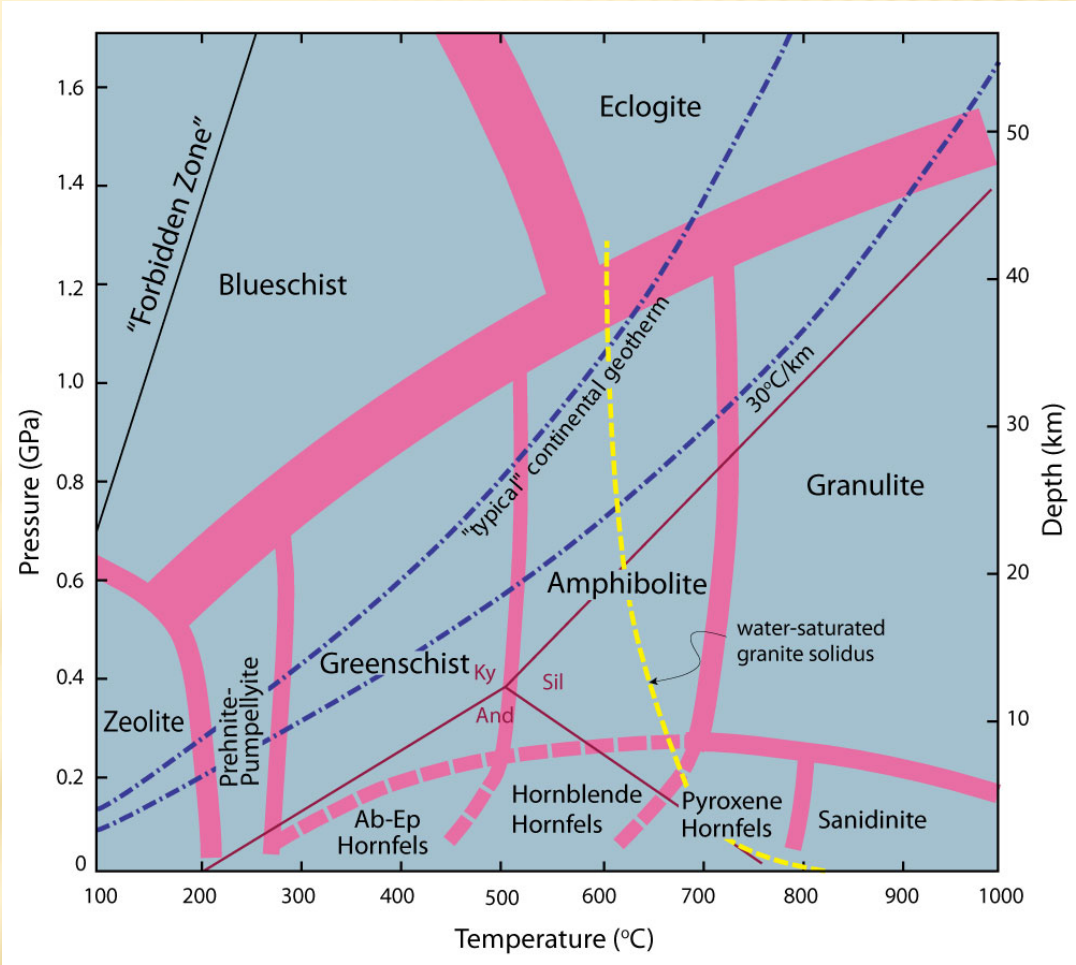
- Chemical formula $NaAl_2\ [(OH)_2\ Al\ Si_3O_{10}$
- Most commonly in metamorphosed rocks under blueshist facies

CHEMISTRY OF GLAUCOPHANE

- Chemical formula $Na_2(Fe, Mg)_3$ $Al2Si_8O_{22}(OH)_2$
- Hardness 5-6
- Specific gravity 3-3.2
- Metamorphic. That is low temperature and high pressure

WHICH ROCKS ARE UNDER HIGH TEMPERATURE AND PRESSURE

1. Blueschist
2. Eclogite.



Winter 25.2

MINERALS IN METAMORPHIC ROCKS

Table 25-1. Definitive Mineral Assemblages of Metamorphic Facie

Facies	Definitive Mineral Assemblage in Mafic Ro
Zeolite	zeolites: especially laumontite, wairakite, analcime
Prehnite-Pumpellyite	prehnite + pumpellyite (+ chlorite + albite)
Greenschist	chlorite + albite + epidote (or zoisite) + quartz ± ac
Amphibolite	hornblende + plagioclase (oligoclase-andesine) ±
Granulite	orthopyroxene (+ clinopyrixene + plagioclase ± ga hornblende)
Blueschist	glaucophane + lawsonite or epidote (+albite ± chl
Eclogite	pyrope garnet + omphacitic pyroxene (± kyanite)
Contact Facies	Mineral assemblages in mafic rocks of the facies of contact morphism do not differ substantially from that of the corresp regional facies at higher pressure.

After Spear (1993)

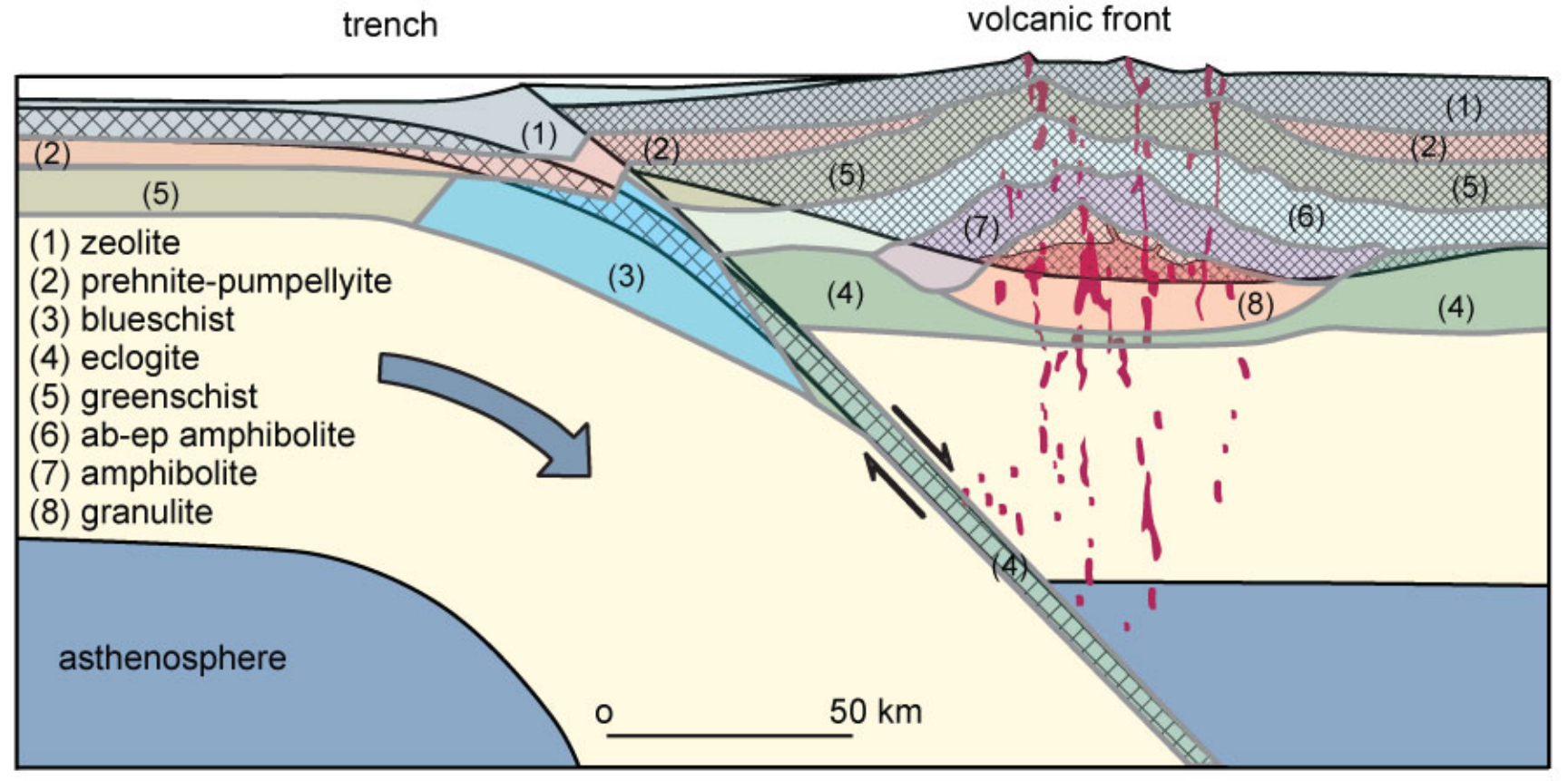
Winter Table 25.1

Facies of high pressure

- The blueschist and eclogite facies: low molar volume phases under conditions of high pressure
  - **Blueschist facies**- areas of low T/P gradients: subduction zones
- **Eclogites**: stable under normal geothermal conditions

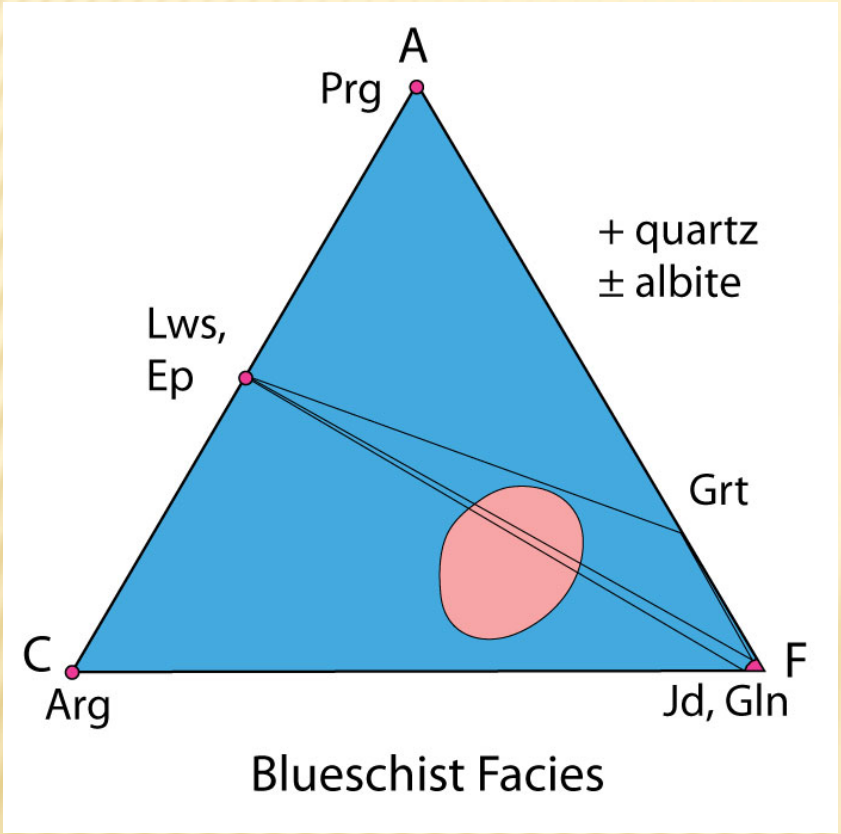
  Deep crustal chambers or dikes, sub-crustal magmatic underplates, subducted crust that is redistributed into the mantle

METAMORPHIC FACIES

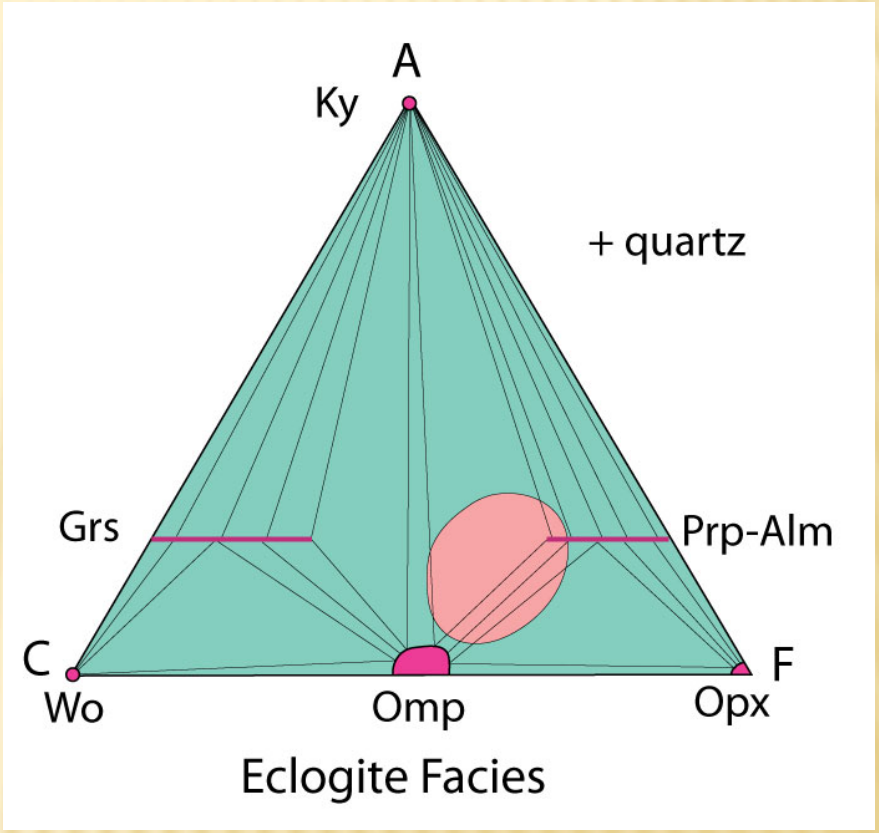


Winter figure 25.4

BLUESCHIST



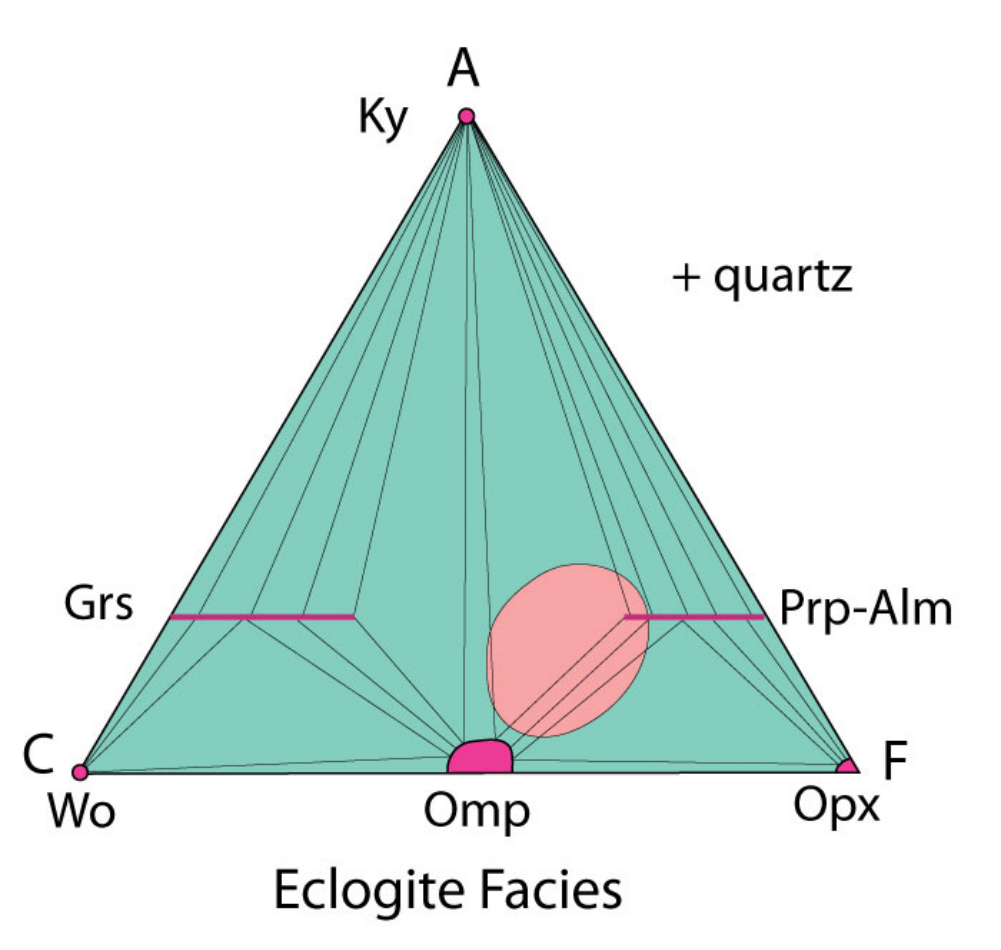
ECLOGITE



TRANSITION FROM BLUESCHIST TO ECLOGITE

Winter figure 25.11 and 25.12

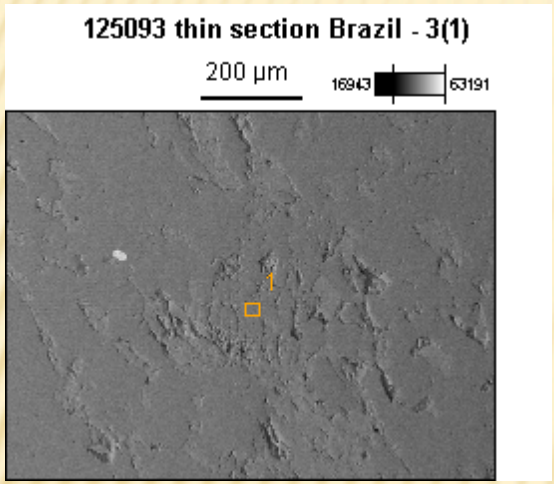
ACF DIAGRAM OF MINERAL ASSEMBLAGE IN ECLOGITE

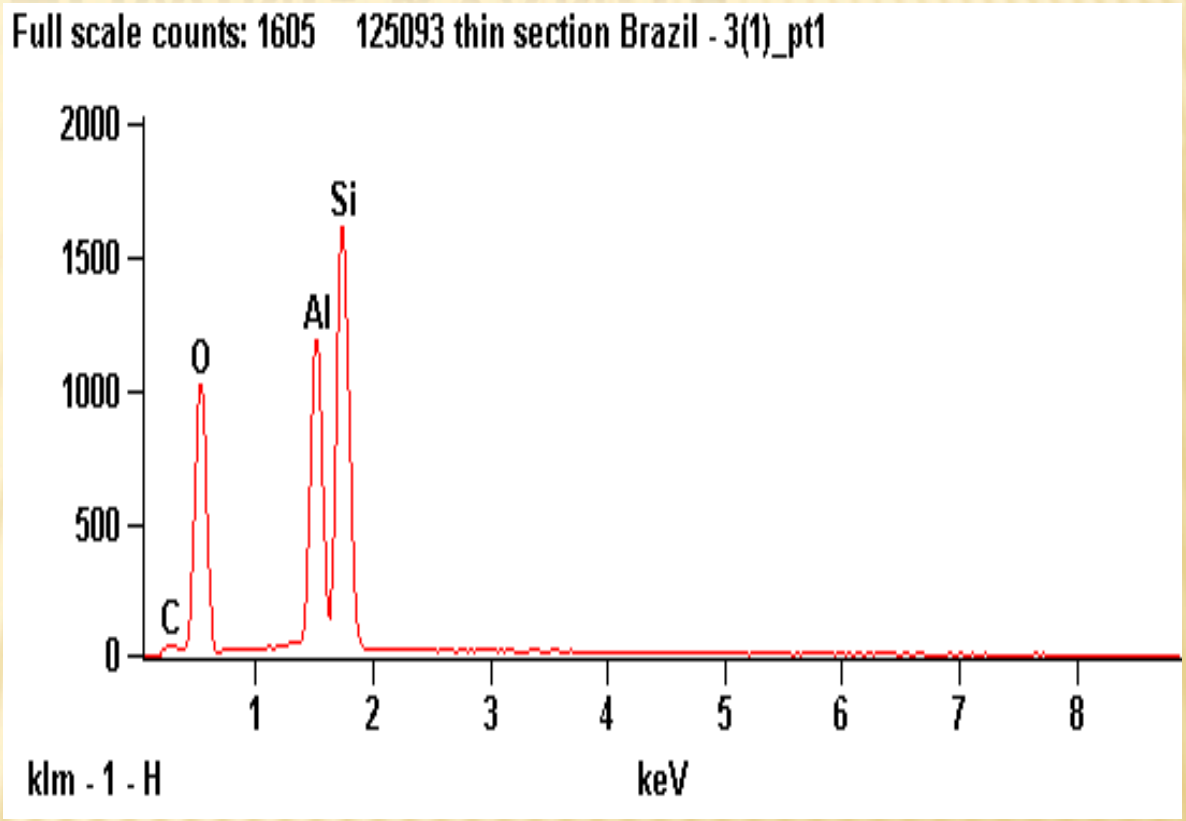


Winter figure 25.12

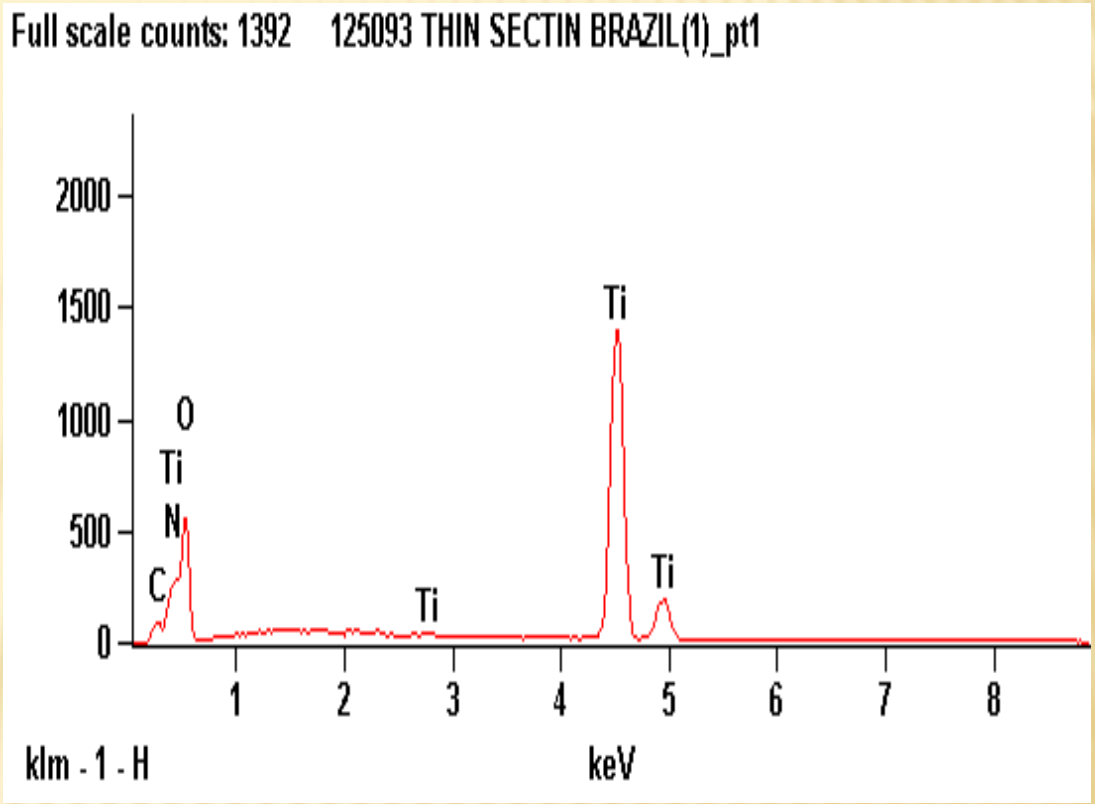
CARBON COATING MACHINE

SEM SHOWING KYANITE

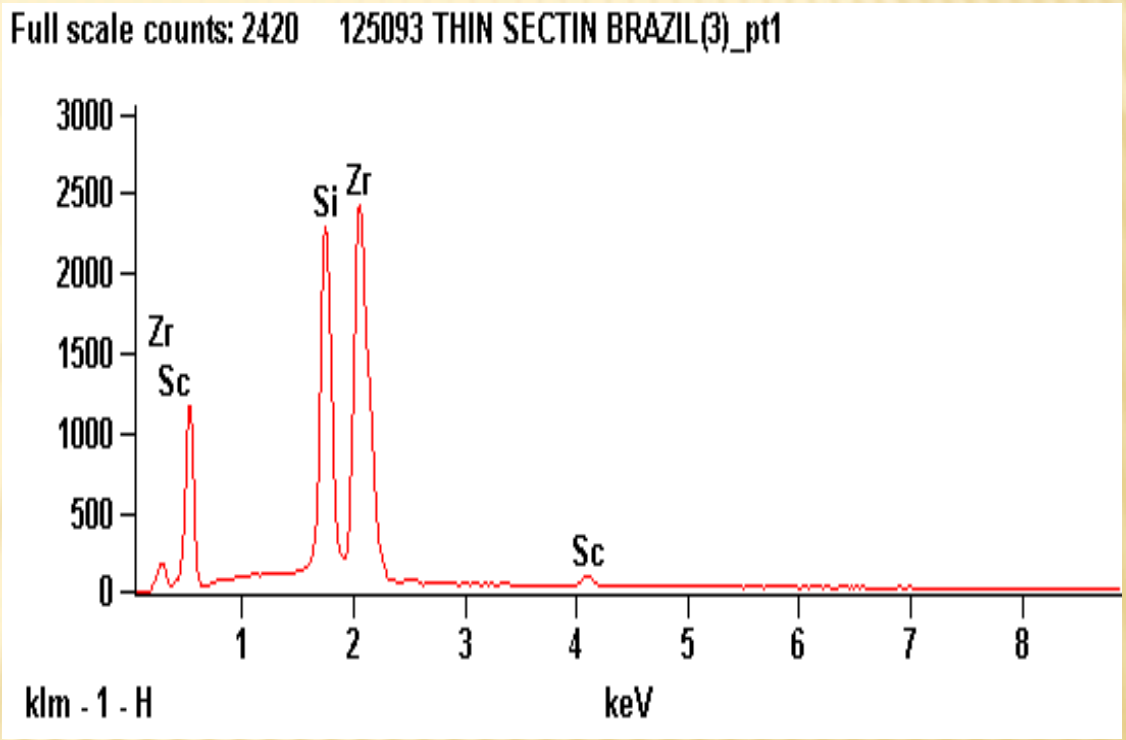




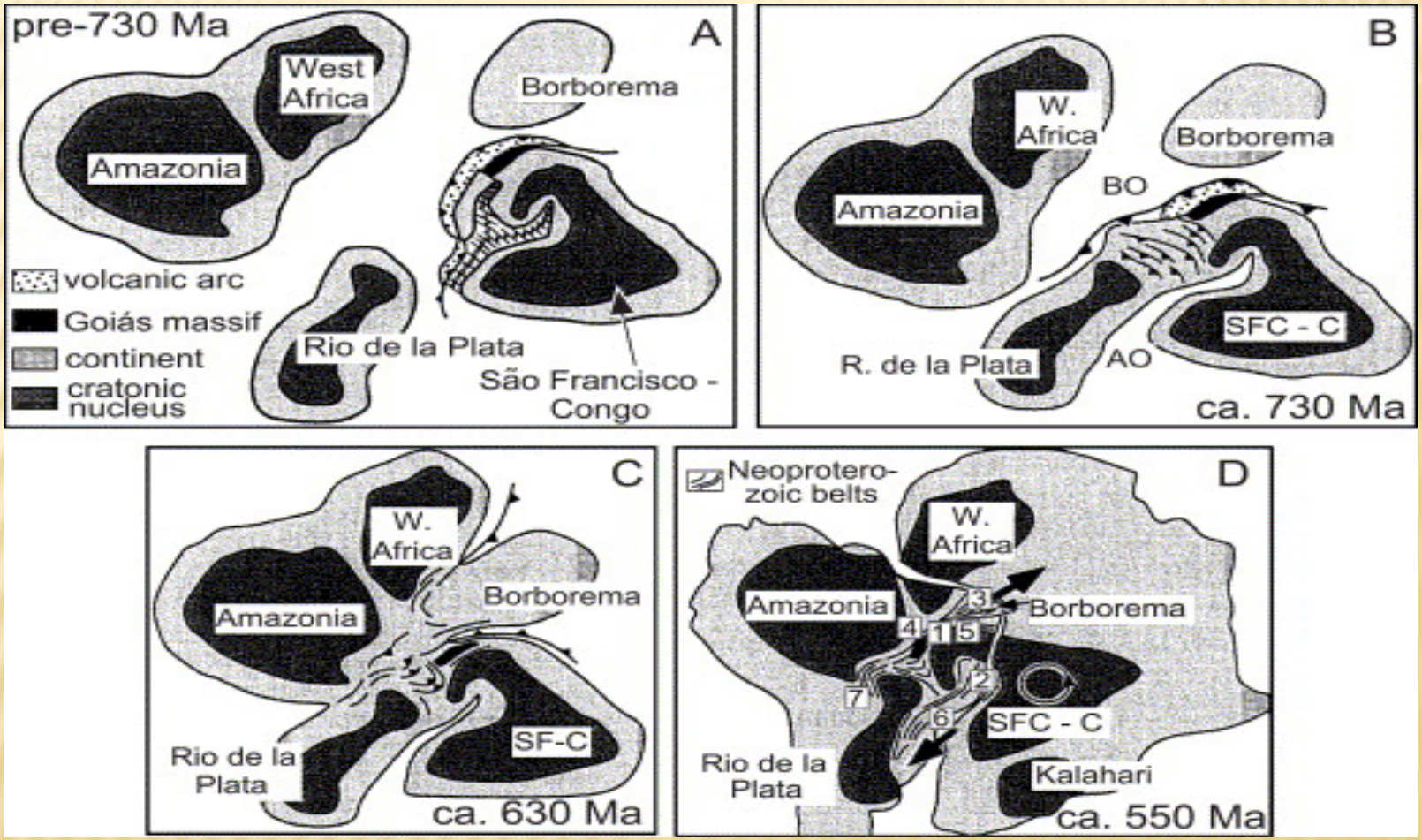
SEM SHOWING RUTILE COMPOUNDS

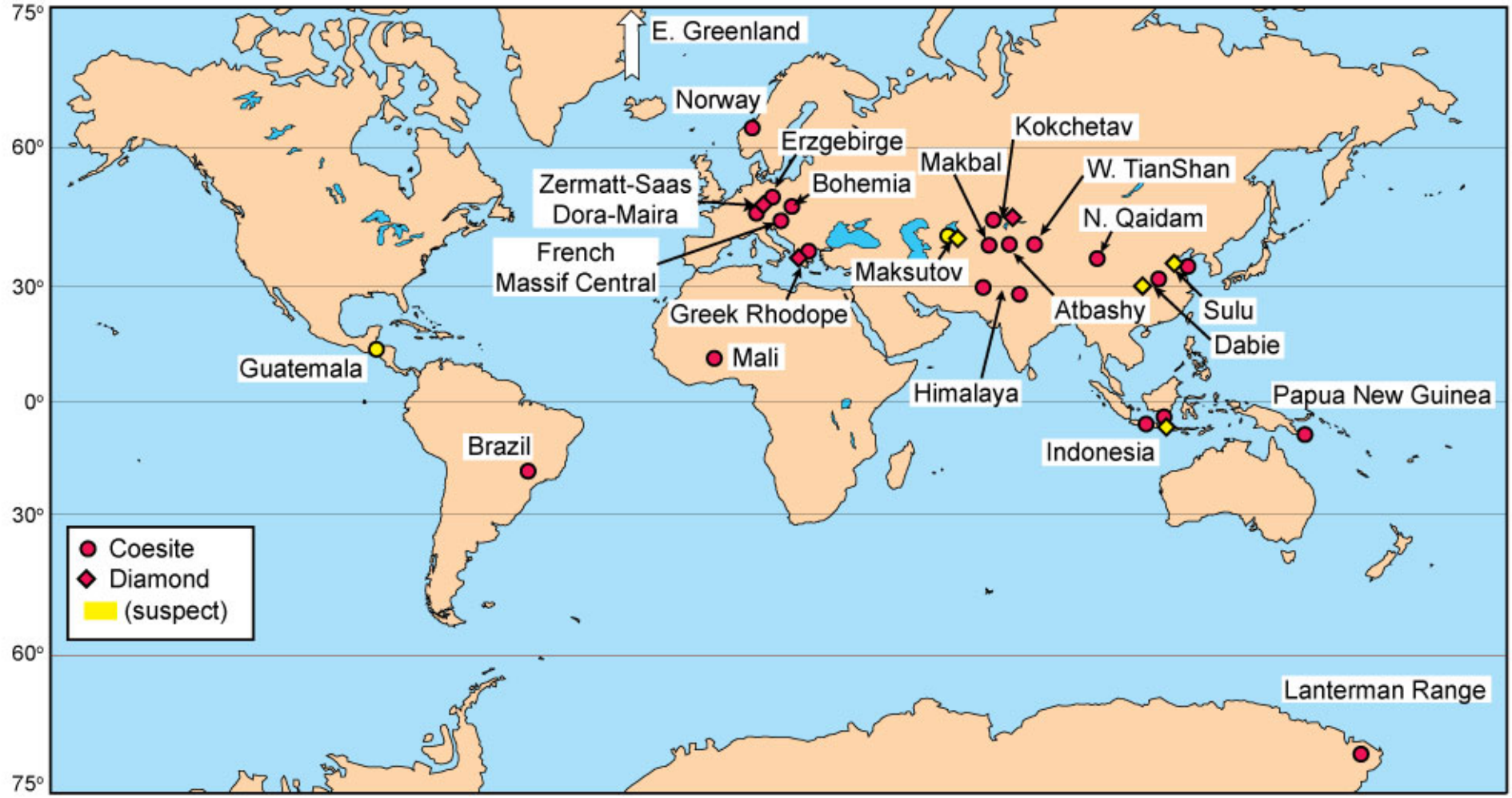


SEM WITH ZIRCON AND SCANDIUM



FORMATION OF CONTINENTS





Winter figure 25.13

CONCLUSION

- With the work done on the unknown sample, using X Ray diffraction, XRF, SEM to know the mineral content.
- Also using the P/T diagram to know what zone it could be found.
- We assume that the unknown rock is Eclogite.

REFERENCES CITED

- Cornelis Klein and Barbara Dutrow 23rd Edition Mineral Science
- John D. Winter Principle of Igneous and Metamorphic Petrology 2nd Edition p 537-555

THANKS FOR LISTENING AND GOODLUCK ON YOUR FINALS