Mineralogy of the Colorado Grande Vein of Snyder Mine, NV

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4/26/2012

NDSU Petrology 422

Background

- Midas deposit
  - Deposited 15.4 Ma
- Located in Elko County, NV
- Near the northern Nevada rift
- Located at the end of the Carlin Trend deposit

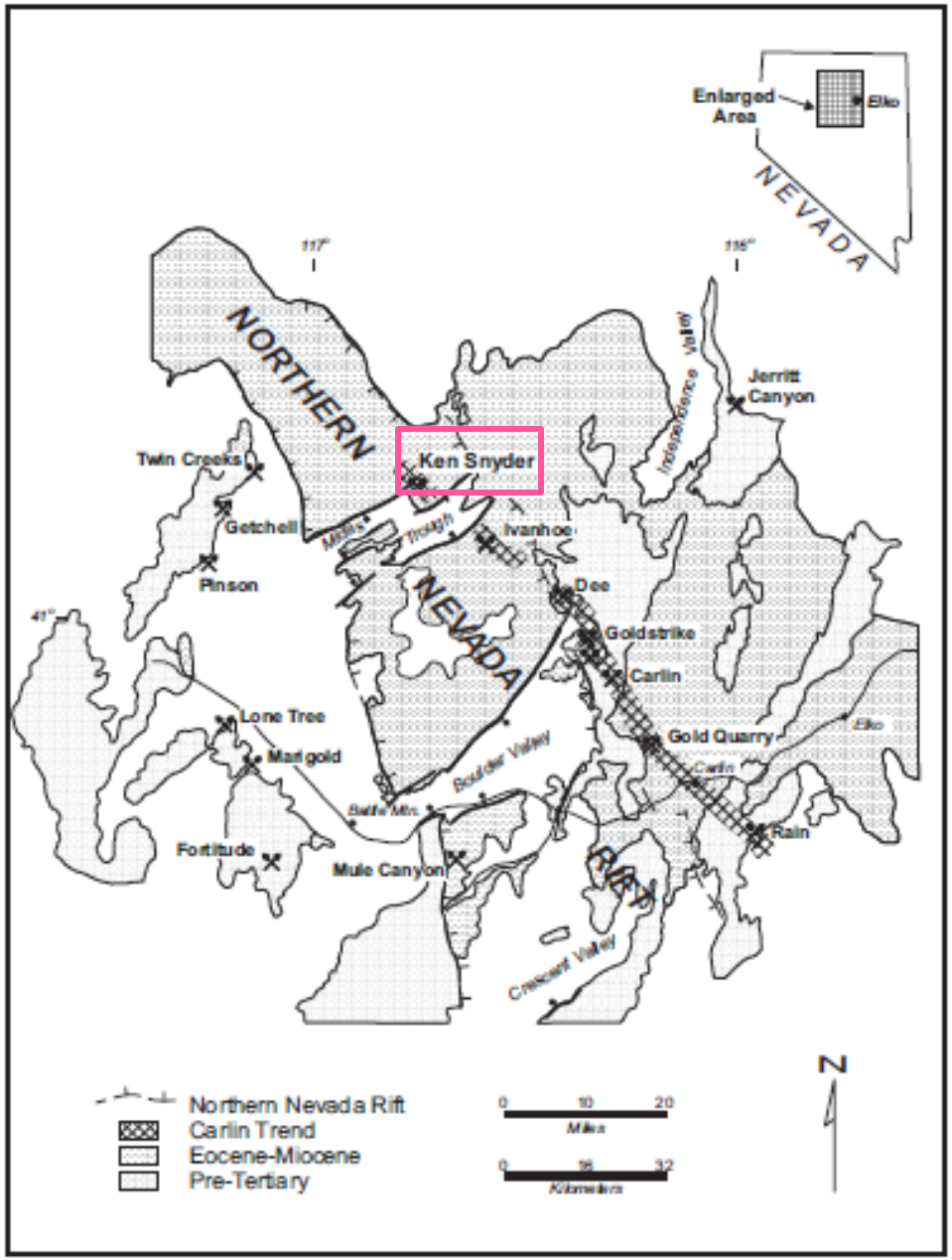
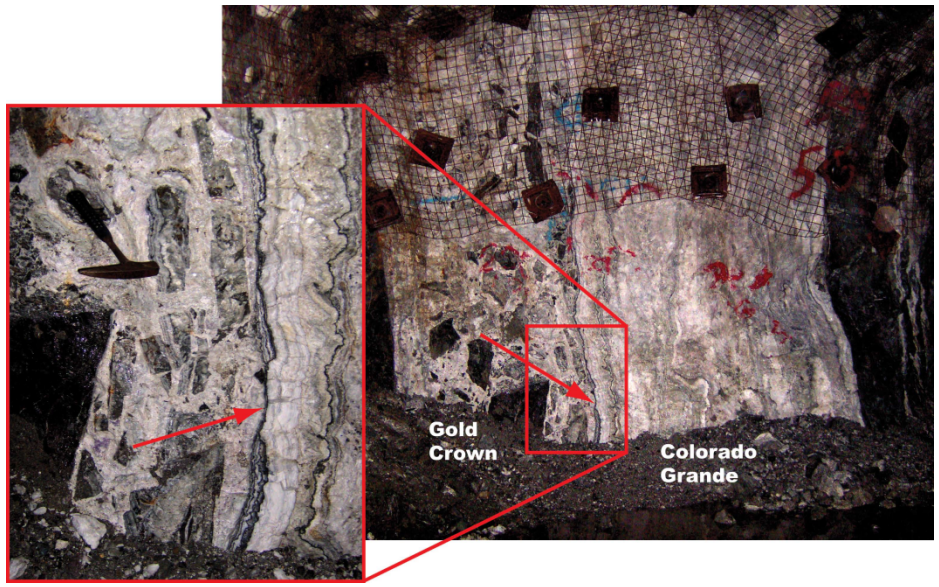


Diagram Courtesy of Goldstrand, P.M., and Schmidt, K.W.

Formation

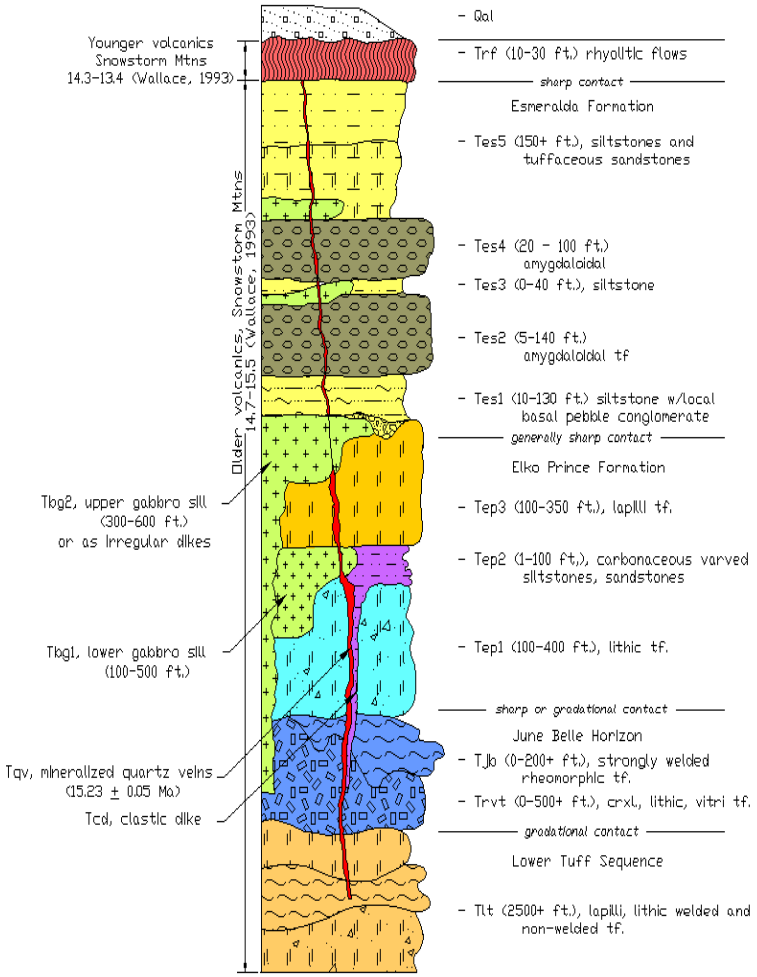
- Epithermal Vein
  - Low temperature fluids
  - Low salinities
  - Form in preexisting structures
    - Faults
  - Multiple pulses of fluid
    - Inconsistent number of bands
    - Variable size and diameter



Colorado Grande Vein,
Ken Snyder Mine

Photo from Riederer, M.J., and Brown, P.E

Midas Area Stratigraphy



- Found in 3 formations
  - June Belle Formation
  - Elko Prince Formation
  - Esmeralda Formation

Photo from Goldstrand, P.M., and Schmidt, K.W

Reflected Light Microscopy

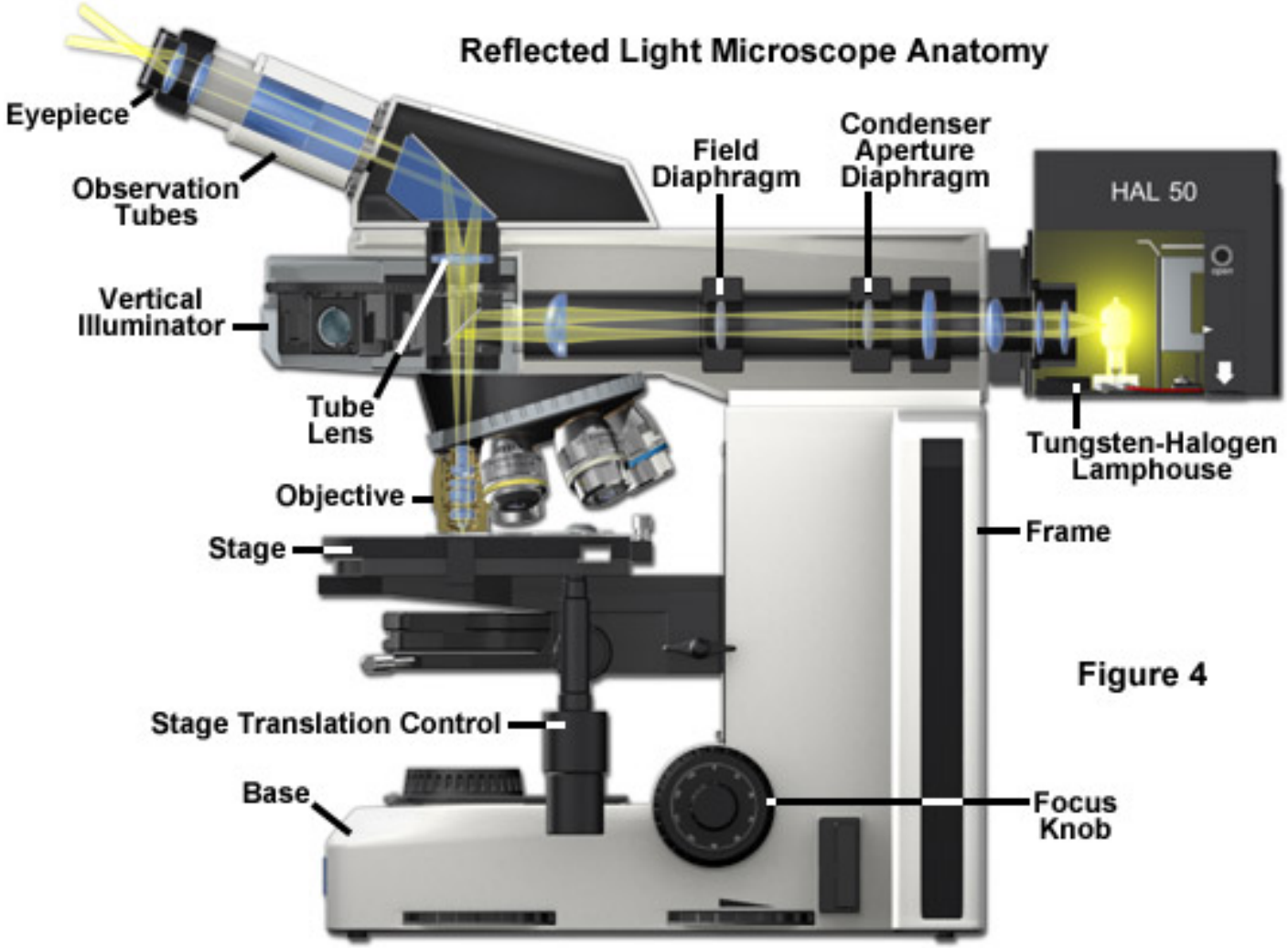
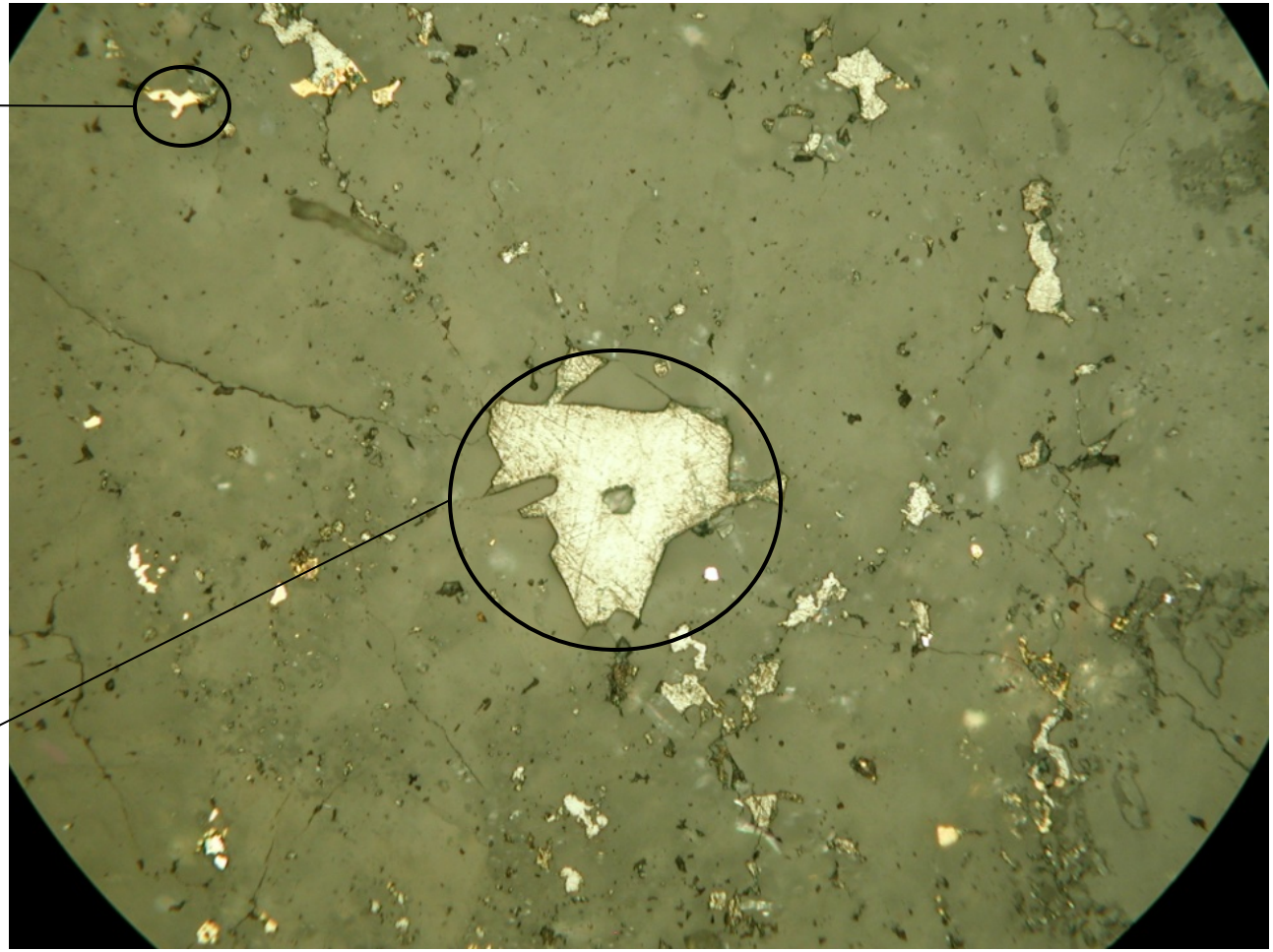


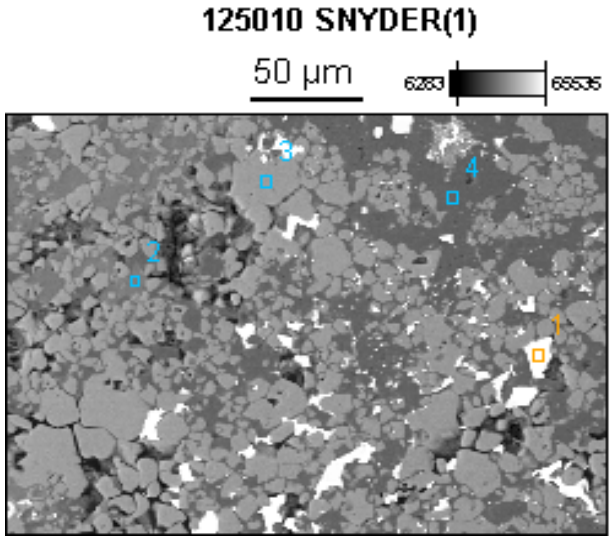
Figure 4

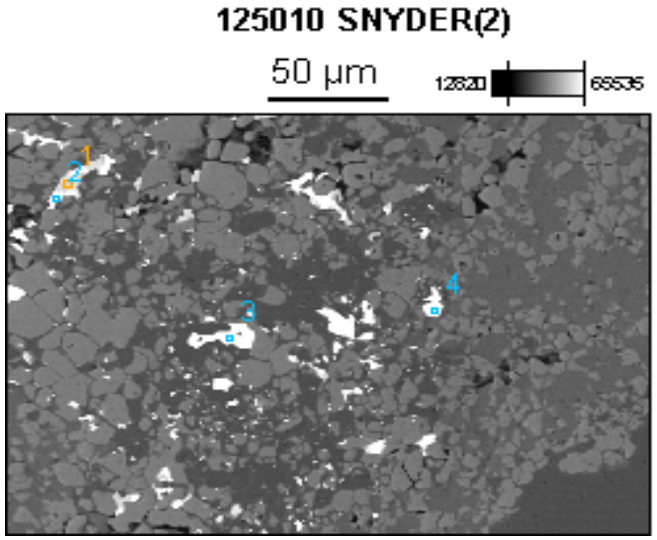
http://zeiss-campus.magnet.fsu.edu/articles/basics/images/opticaltrainfigure4.jpg

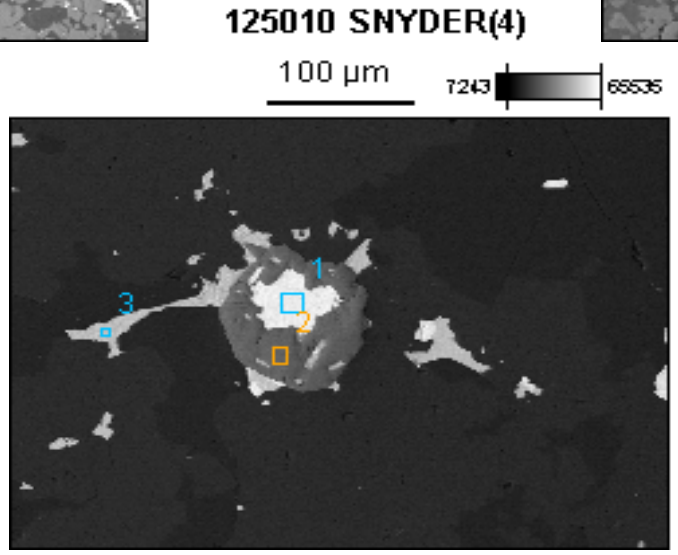
Reflected Light Microscopy



Scanning Electron Microscopy

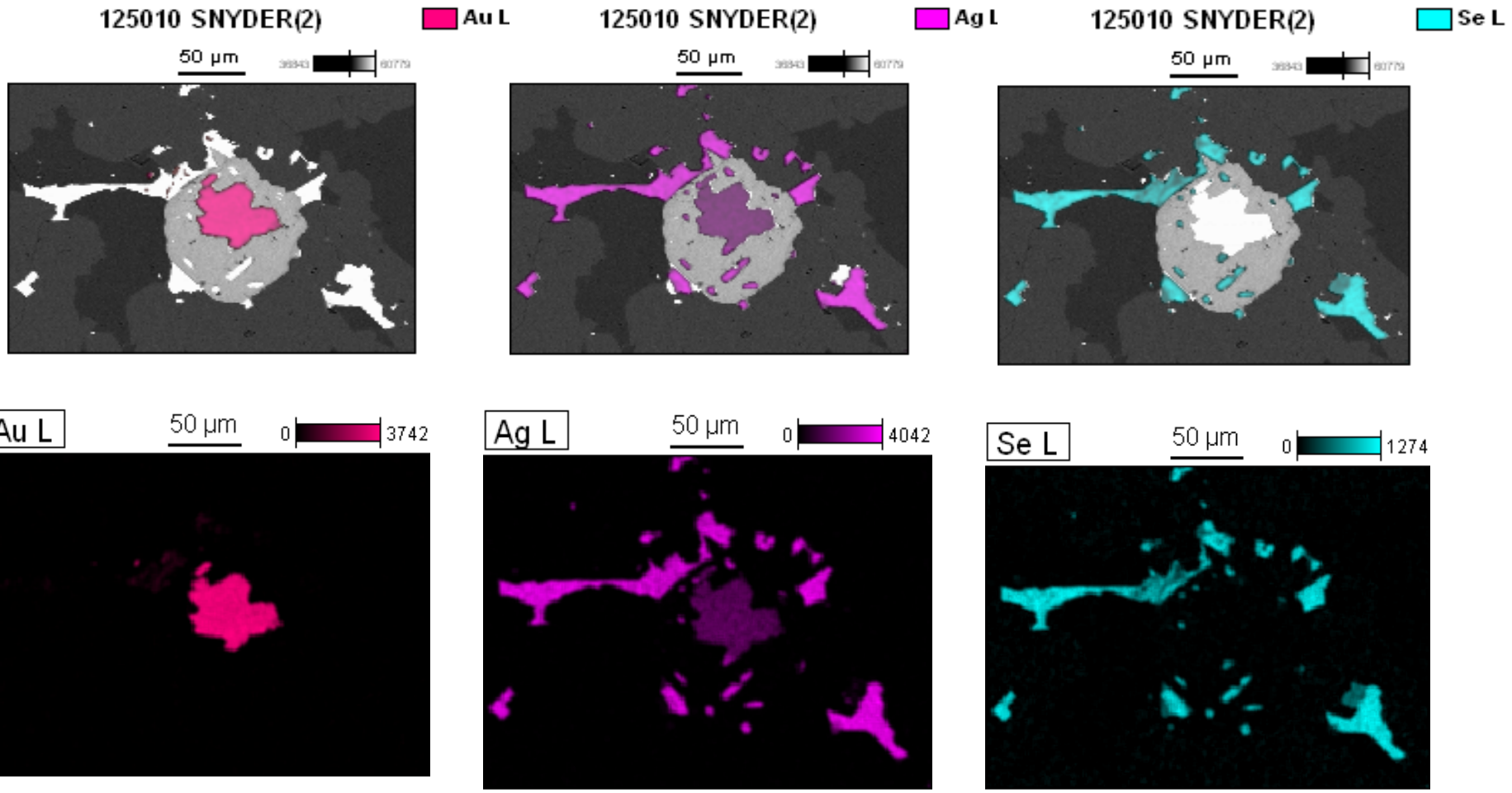






SEM Mapping

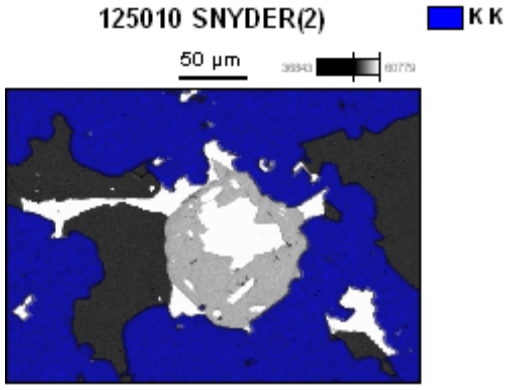
Snyder 4

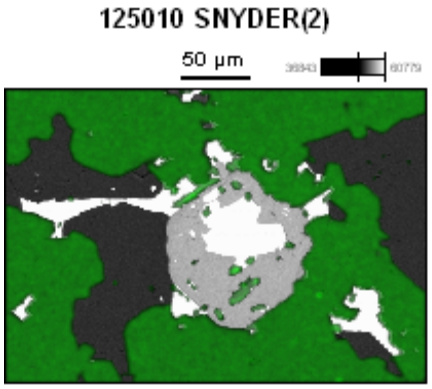


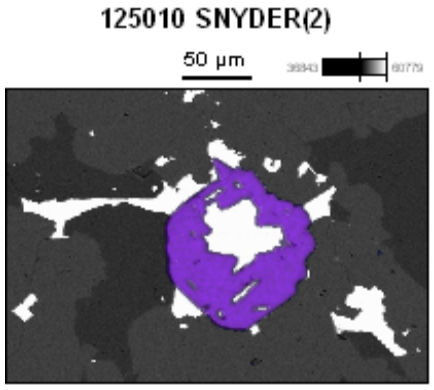
http://www.ndsu.edu/em_lab/

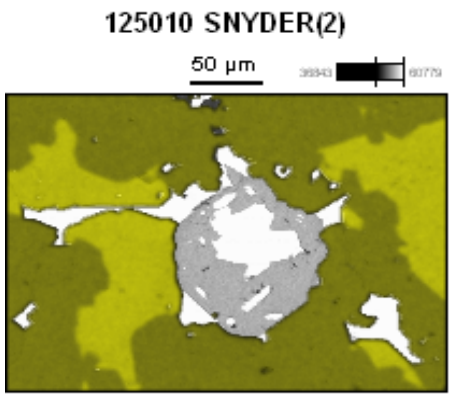
SEM Mapping

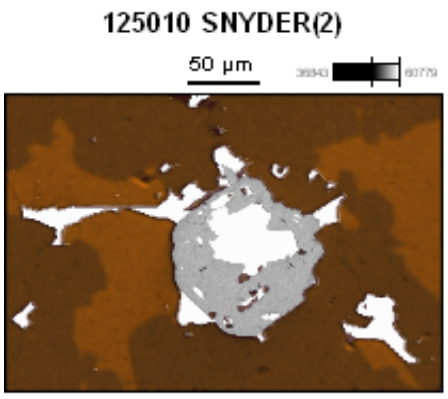
Snyder 4

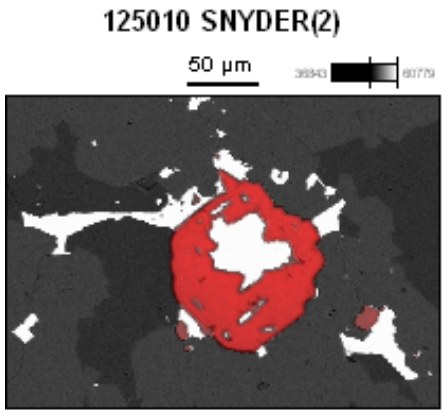










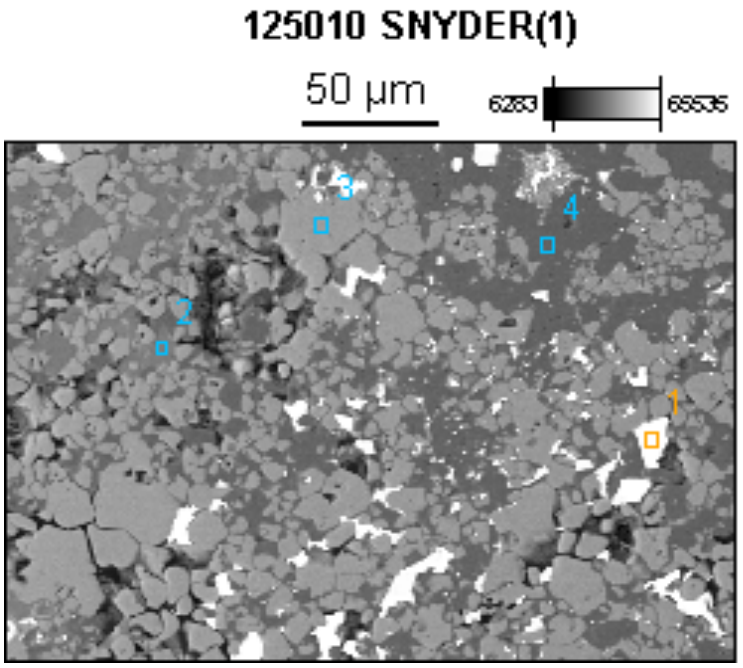


http://www.ndsu.edu/em_lab/

Chemical Analysis Results

Snyder 1

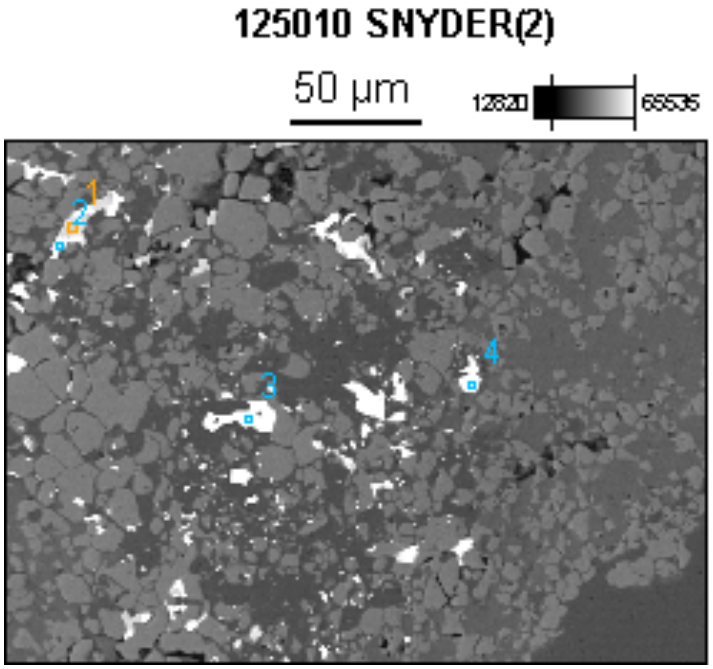
Atomic %	Point 1	Point 2	Point 3	Point 4
S	20.80			
Se	22.54			
Ag	40.23			
Ca		23.89	23.89	
F			70.86	
Si				30.06
O		76.11		69.94
Pb	16.43			
Sum (Se+S)	43.34			
Se Proportion	0.52			
S Proportion	0.48			
Atomic Ratios				
(Se+S)	2.64			
Ag	2.45			
Ca		1.00	1.00	
F			2.97	
Si				1.00
O		3.19		2.33
Pb	1.00			



Chemical Analysis Results

Snyder 2

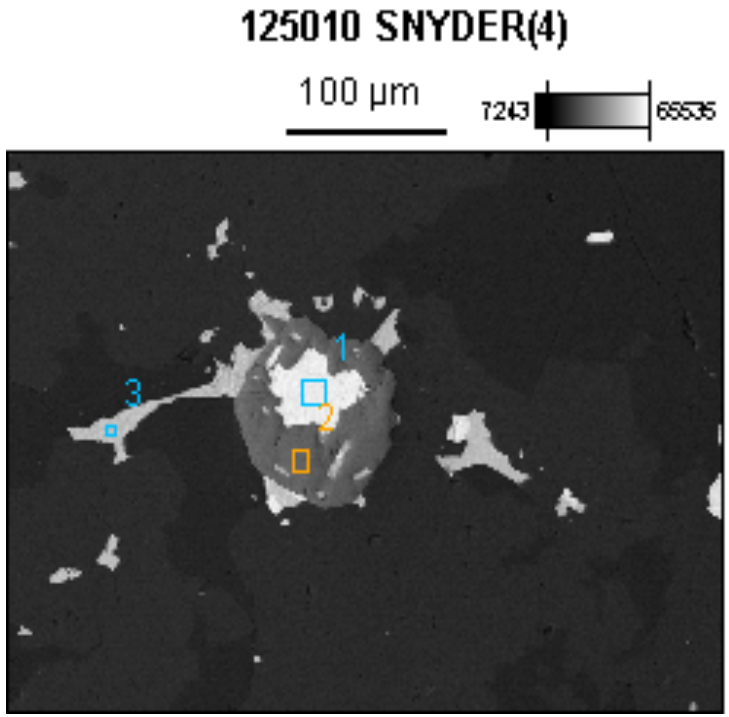
Atomic %	Point 1	Point 2	Point 3	Point 4
S	56.33	8.10	6.82	7.91
Fe	22.38			
Cu	21.09			
Se		28.10	30.16	29.76
Ag		63.80	63.02	62.33
Sum (Se+S)	56.33	36.20	36.98	37.67
Se Proportion	0.00	0.78	0.82	0.79
S Proportion	1.00	0.22	0.18	0.21
Atomic Ratios				
(Se+S)	2.67	1.00	1.00	1.00
Fe	1.06			
Cu	1.00			
Ag		1.76	1.70	1.65



Chemical Analysis Results

Snyder 4

Atomic %	Point 1	Point 2	Point 3
S		70.44	4.32
Fe		29.56	
Se			34.22
Ag	51.18		61.46
Au	48.82		
Sum (Se+S)		70.44	38.54
Se Proportion		0.00	0.89
S Proportion		1.00	0.11
Atomic Ratios			
(Se+S)		2.38	1.00
Fe		1.00	
Ag	51.18		1.59
Au	48.82		



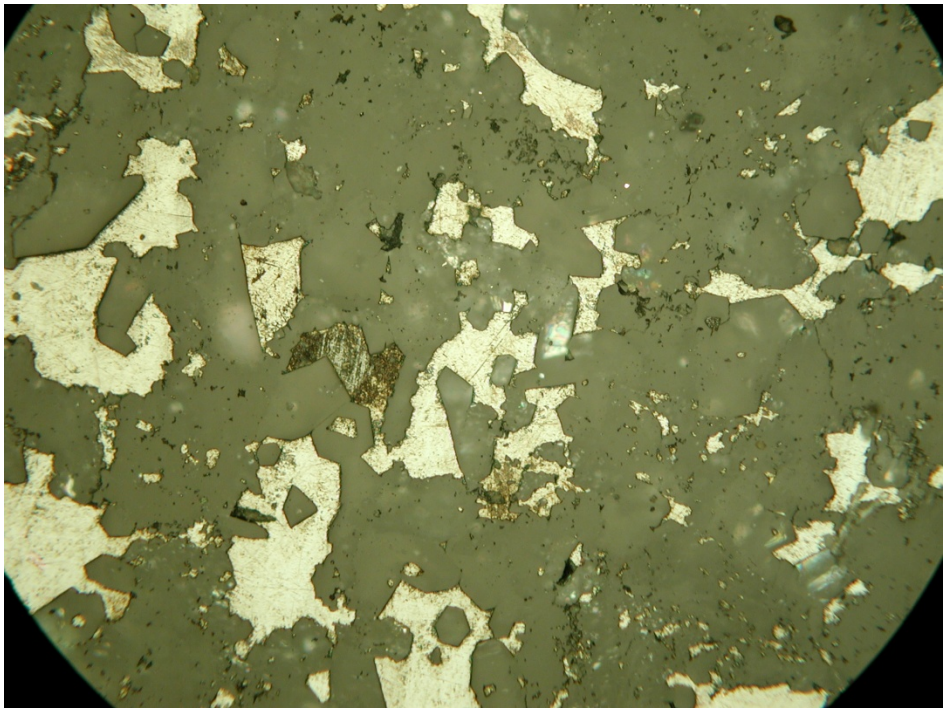
Mineralogy

SEM Photo	Reference Point	Calculated Mineral Formula	Mineral	Mineral Formula
Snyder 1	Point 1	$PbAg_{2.64}(Se_{.52},S_{.48})_{2.45}$	Galena & Naumannite	PbS & Ag_2Se
	Point 2	$CaO_{3.19}$	Calcite	$CaCO_3$
	Point 3	$CaF_{2.97}$	Fluorite	CaF_2
	Point 4	$SiO_{2.33}$	Quartz	SiO_2
Snyder 2	Point 1	$CuFe_{1.06}S_{2.67}$	Chalcopyrite	$CuFeS_2$
	Point 2	$Ag_{1.76}(Se_{.78},S_{.22})$	Naumannite	Ag_2Se
	Point 3	$Ag_{1.704}(Se_{.82},S_{.18})$	Naumannite	Ag_2Se
	Point 4	$Ag_{1.65}(Se_{.79},S_{.21})$	Naumannite	Ag_2Se
Snyder 4	Point 1	$Au_{48.82}Ag_{51.18}$	Electrum	AuAg
	Point 2	$FeS_{2.4}$	Pyrite	FeS_2
	Point 3	$Ag_{1.6}(Se_{.89},S_{.11})$	Naumannite	Ag_2Se

Mineralogy

- Gangue Minerals
  - Valueless minerals associated with ore minerals
  - Quartz SiO_2
  - Calcite $CaCO_3$
  - Adularia $KAlSi_3O_8$
    - Variety of orthoclase formed at low temperatures
  - Galena PbS
  - Chalcopyrite $CuFeS_2$
  - Pyrite FeS_2
  - Fluorite CaF_2

Mineralogy



Scale: 2 mm

- Ore Minerals
  - Naumannite Ag_2Se
  - Electrum Au-Ag
    - Naturally occurring Au-Ag alloy

Summary

- Reflected Light Microscopy
- SEM
  - Produced the chemical data used to calculate mineral formulas
  - Mapped chemical distribution
- Compared calculated mineral formulas to actual mineral formulas
  - Some degree of error
- Ore Minerals
- Gangue Minerals

References

- Special thanks to John Marma , Jason Braunberger and Scott Payne
- Goldstrand, P.M., and Schmidt, K.W., 2000, Geology, mineralizatin, and ore controls at the Ken Snyder gold-silver mine, Elko County, Nevada, *in Cluer, J.K.,* Price, J.G., Struhsacker, E.M., Hardyman, R.F., and Morris, C.L., eds., Geology and Ore Deposits 2000: The Great Basin and Beyond: Geological Society of Nevada Symposium Proceedings, May 15-18, 2000, p. 265-287.
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