What is in a Palagonite?

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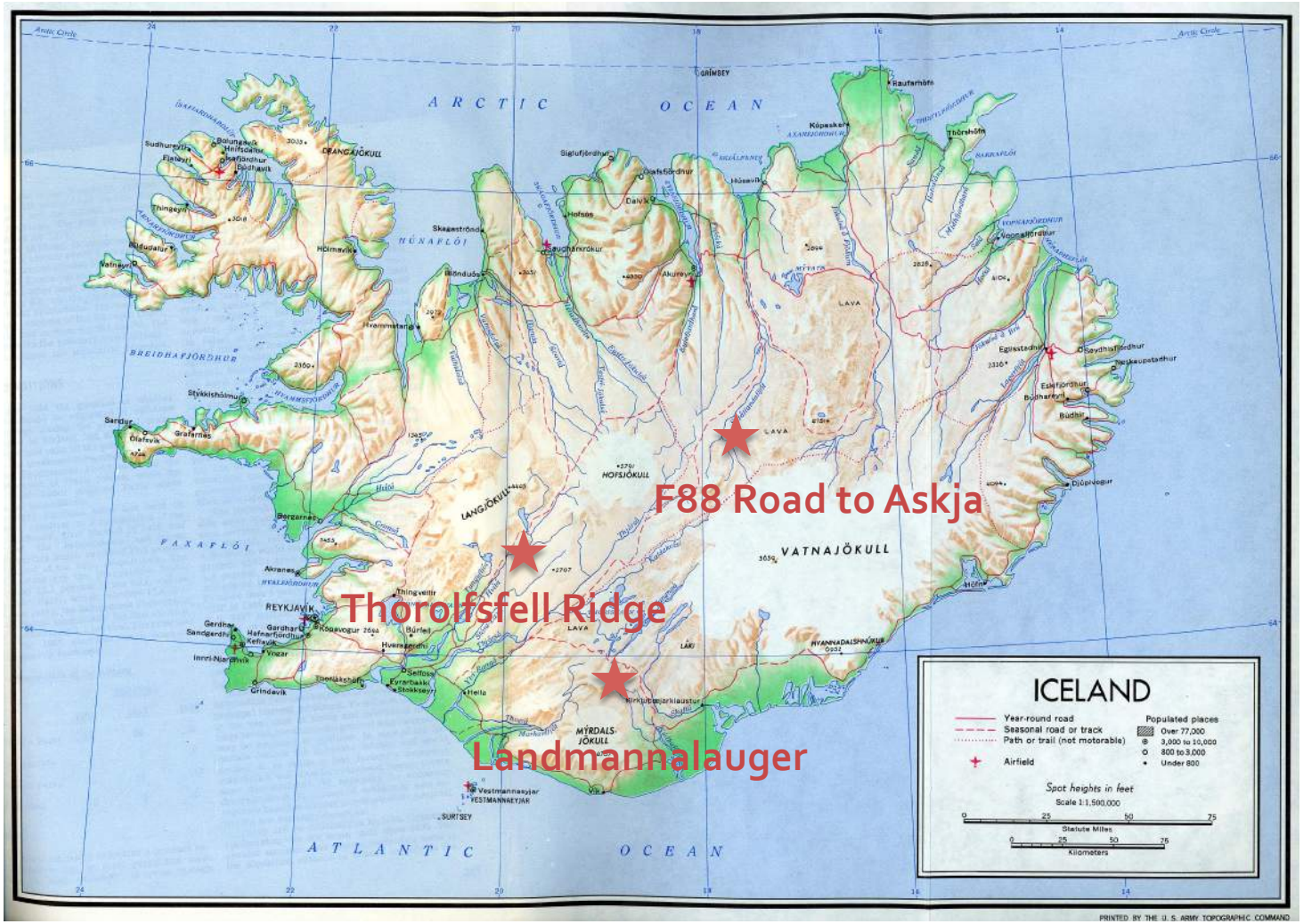
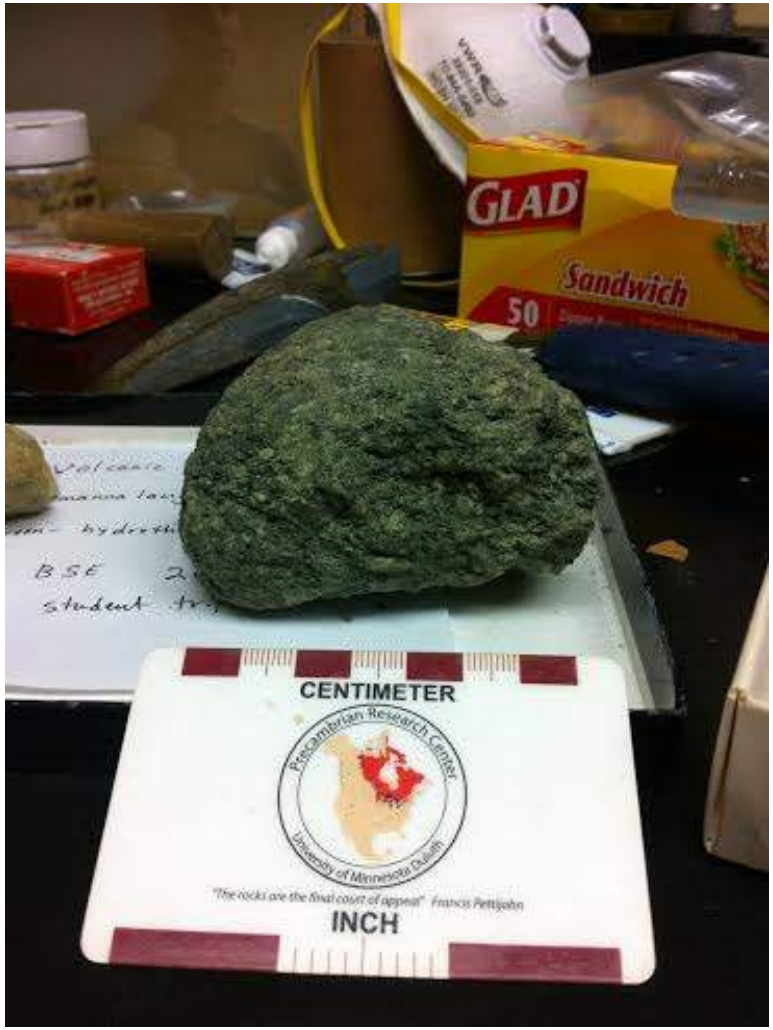
NDSU Petrology - Geol 422 – May 1, 2014

Where in the World?



Landmannalauger

- Hydrothermally altered volcanic rock
- Sample 6Y

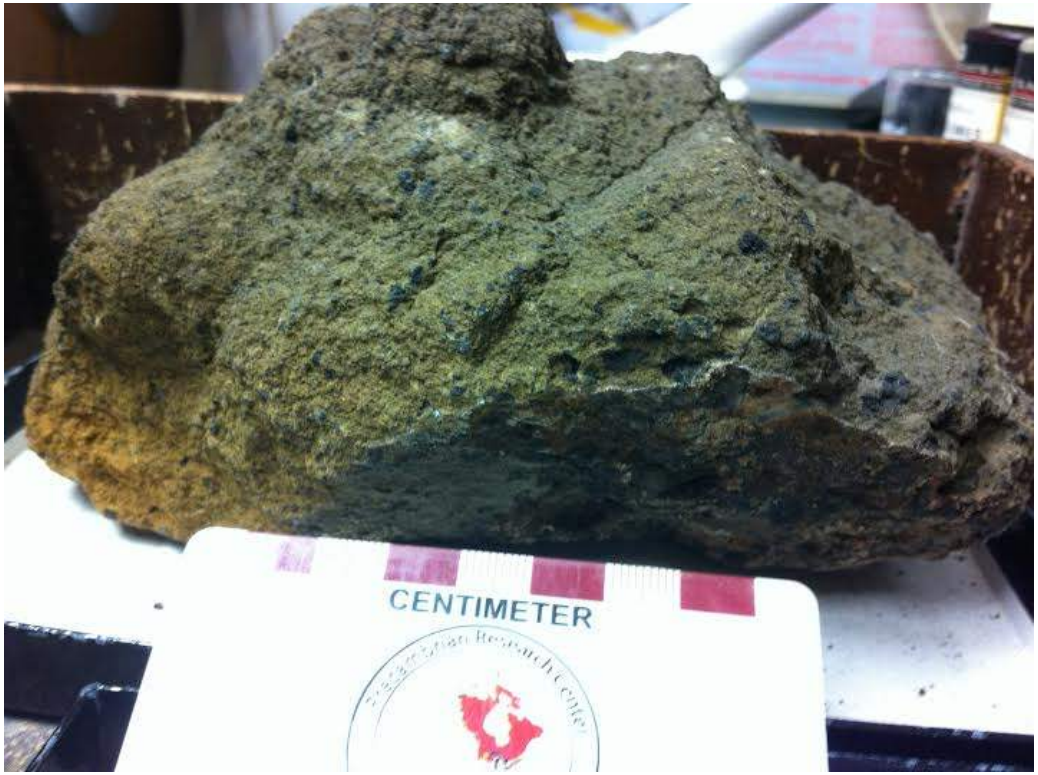


Thoraldsvell/Thorolfsfell Ridge

- Hyaloclastite
- Sample 6W

F88 Road to Askja

- Palagonized basaltic tuff
- Sample 4Y



What is Palagonite?

- altered basaltic glass
- amalgamation of:
  - residual basaltic glass
  - secondary silica
  - zeolites
  - carbonates
  - phosphates
  - hematite
  - Fe- hydroxides
  - poorly crystalline aluminosilicate mineraloids
  - smectite clays
- Hydrated, leached, and/or oxidized glass

Brèche palagonitique (près du Puy en Velay - Hte Loire) n° 153 - Collection : Y. & C. Lemeur

Methods – Clay XRD 1

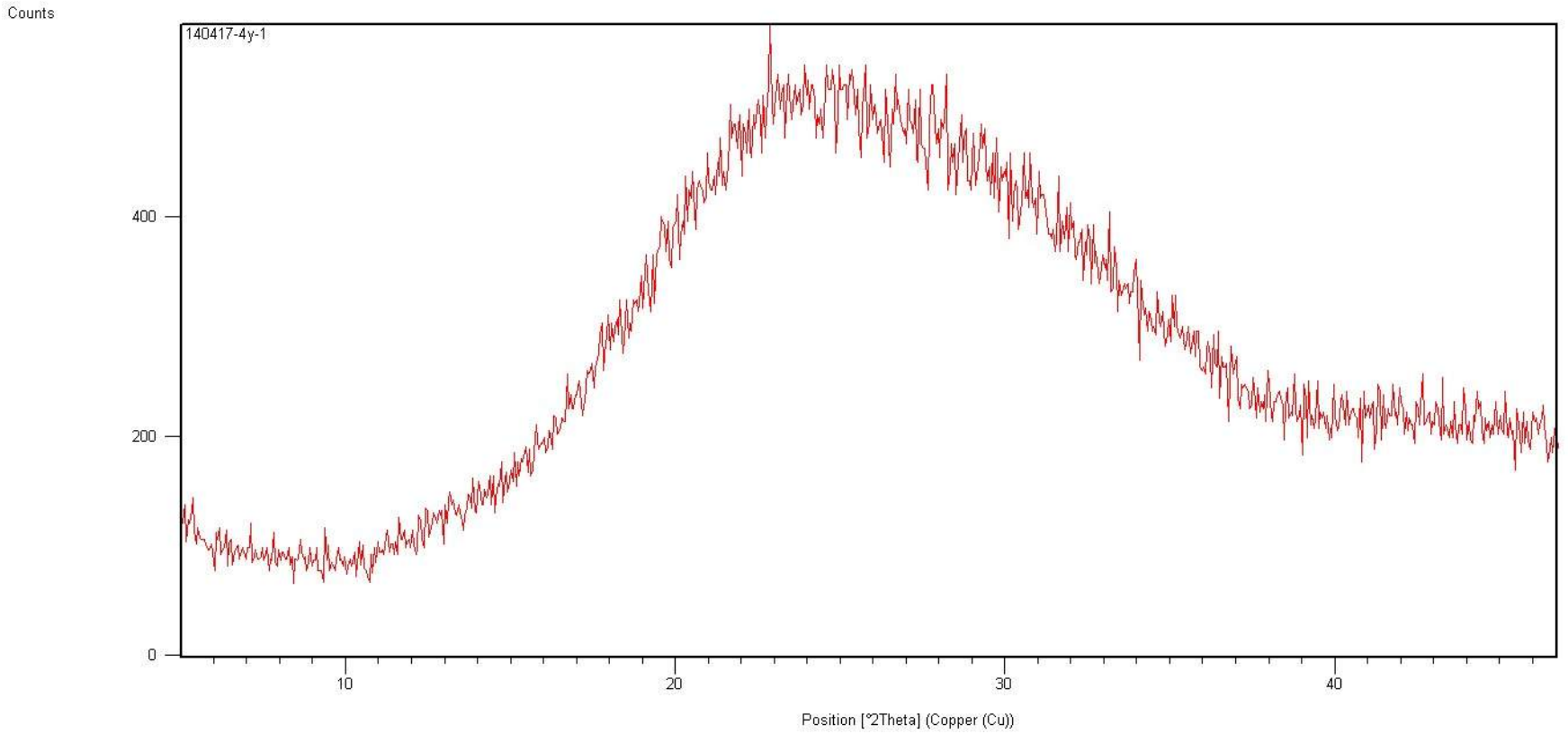
- Grind to <1mm diameter grains
- 20g sample + 10 ml of Sodium Hexametaphosphate + distilled water
- Shake for 3 hours
- Settle for 4 hours
- Pipette upper liquids

Methods - Clay XRD 2

- Vacuum apparatus
  - Fine mesh
  - Filter paper
- Wet
- Pipette sample
- Vacuum
- Place filter on slide
- Peel off filter
- XRD

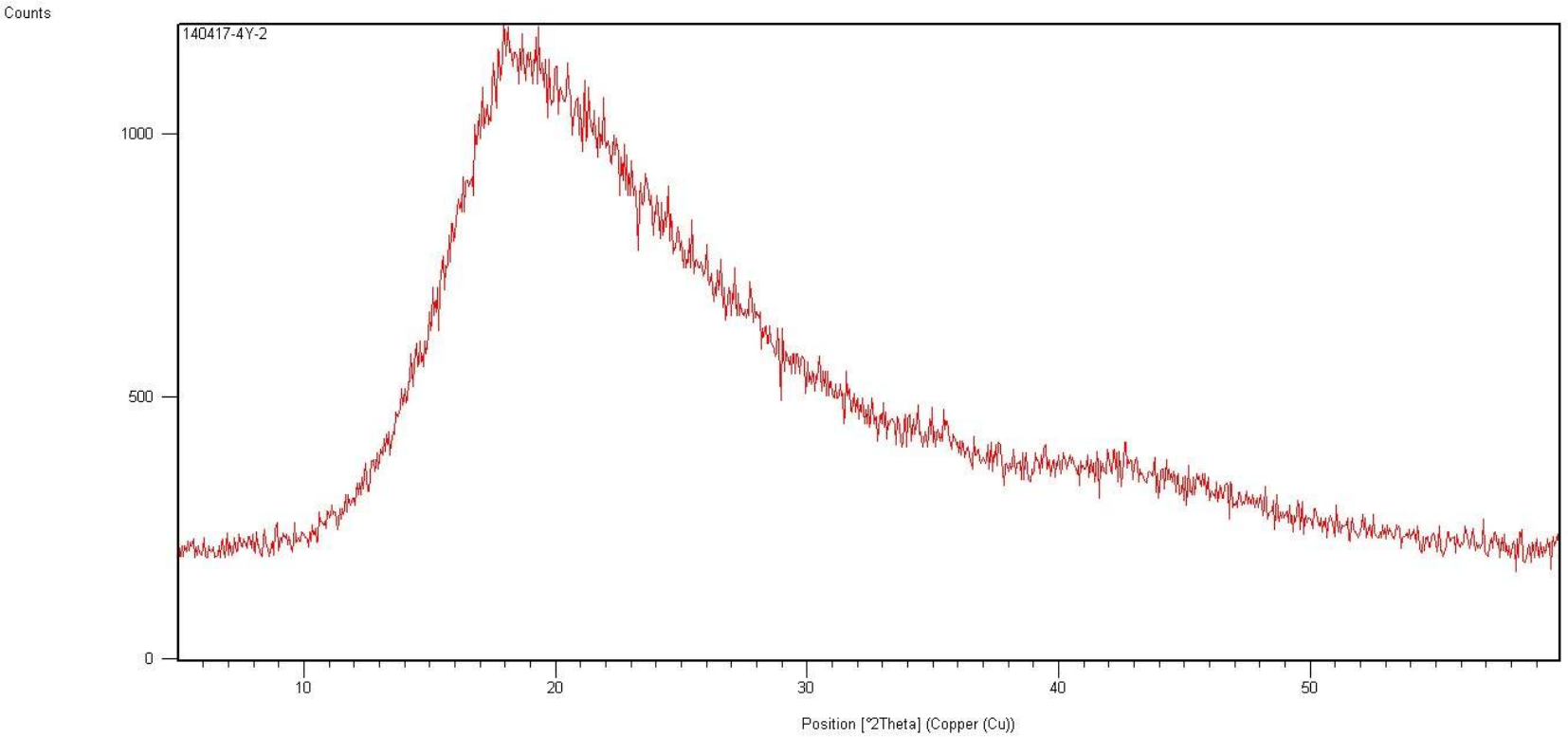
Clay XRD Results 1

- 4Y-1



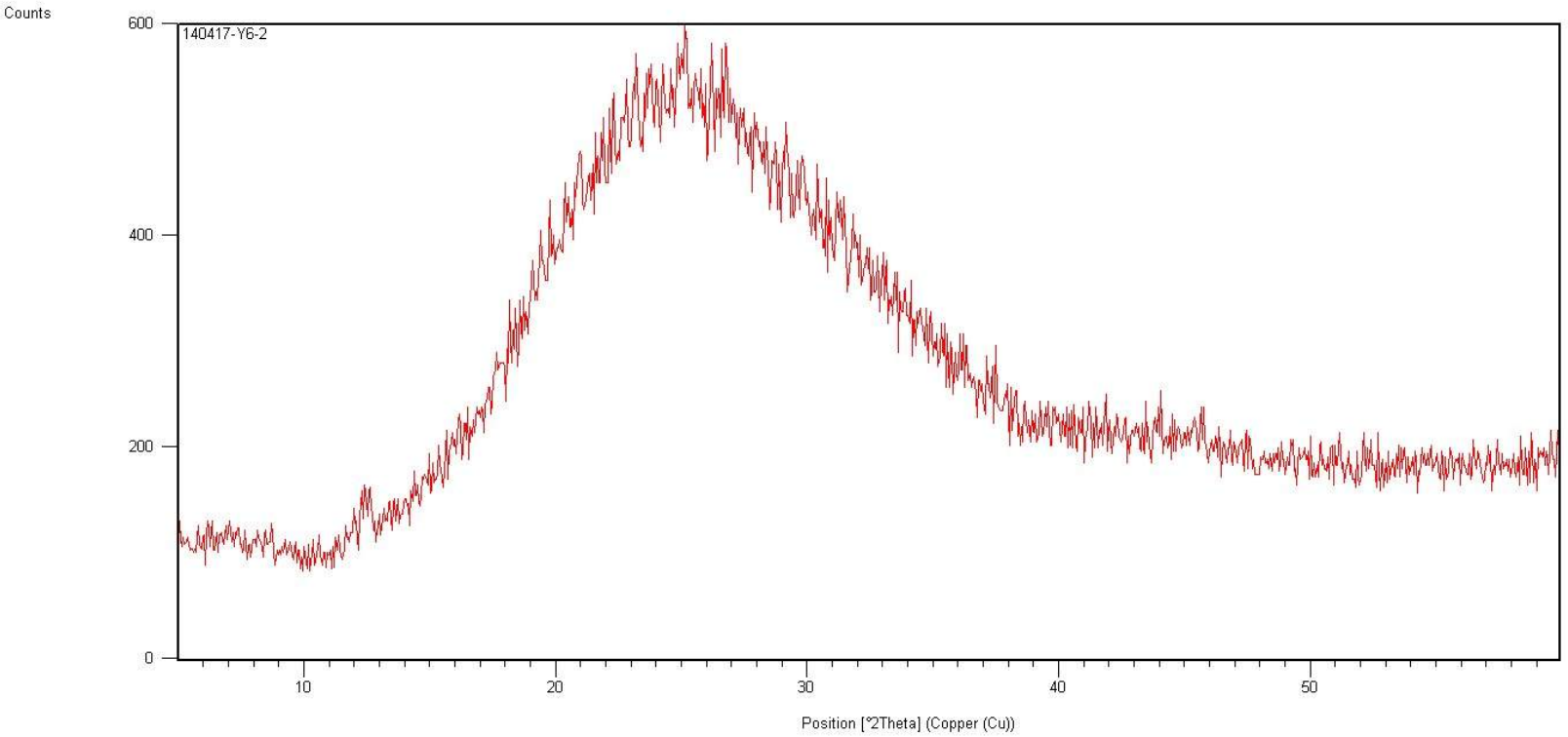
Clay XRD Results 2

- 4Y-2



Clay XRD Results 3

- 6Y-2



Methods – XRF

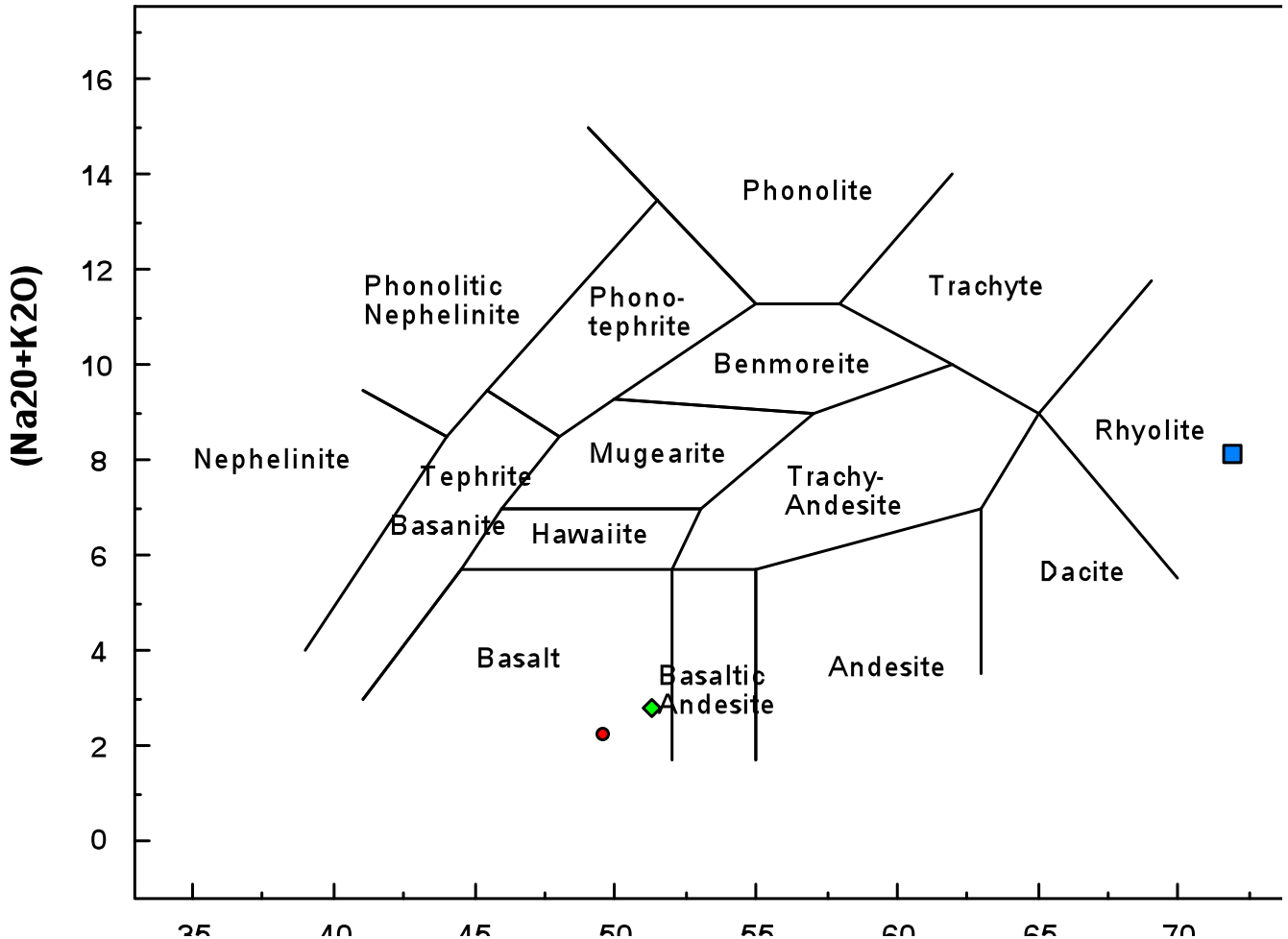
- Grind
- Mix 7g sample + 10 drops polyvinyl
- Press powder pellet
- XRF

XRF - Results

color	plot	SiO2	Al2O3	Fe2O3	CaO	MgO	MnO	Na2O	K2O	P2O5	TiO2
1	0	71.52	13.86	3.98	1.06	0.52	0.09	3.94	4.09	0.04	0.34
2	0	49.16	12.3	12.69	11.76	9.19	0.16	2.02	0.14	0.13	1.41
3	0	50.55	12.01	15.55	9.74	4.06	0.19	2.06	0.64	0.29	3.33

XRF - Results

Blue = Y6
Green = Y_4
Red = W6



Conclusion

- Little to no clays
- Palagonized Tuffs ≈ Basalt
- Hydrothermally altered ≈ Rhyolite

References

- Bishop, J.L., P. Schiffman, and R. Southard. "Geochemical and mineralogical analyses of palagonitic tuffs and altered rinds of pillow basalts in Iceland and applications to Mars." *Volcano-Ice Interaction on Earth and Mars*. London: The Geological Society, 2002. Pages 371-378. Print.
- Michalski, J.R., M.D. Kraft, T.G. Sharp, and P.R. Christensen. "Palagonite-like alteration products on the Earth and Mars I: spectroscopy (0.4-25 microns) of weathered basalts and silicate alteration products." *Lunar and Planetary Science* XXXVI: Web. 28 Apr. 2014.

Questions?