

Saganga Tonalite or not?

By Carl Ludewig

NDSU Geol 422 – Petrology

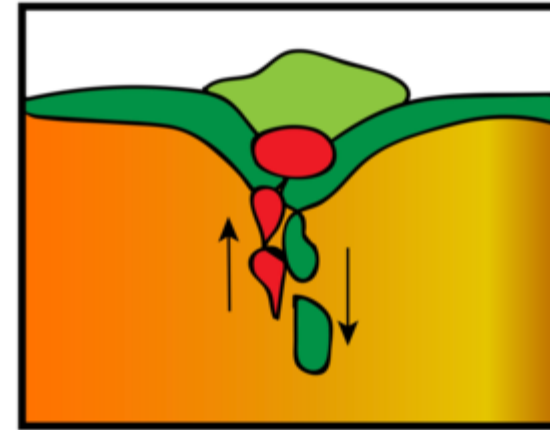
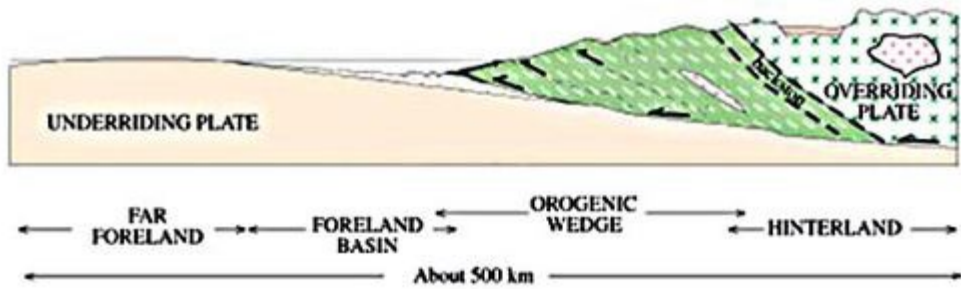
April 28, 2022

Background on Saganaga Tonalite

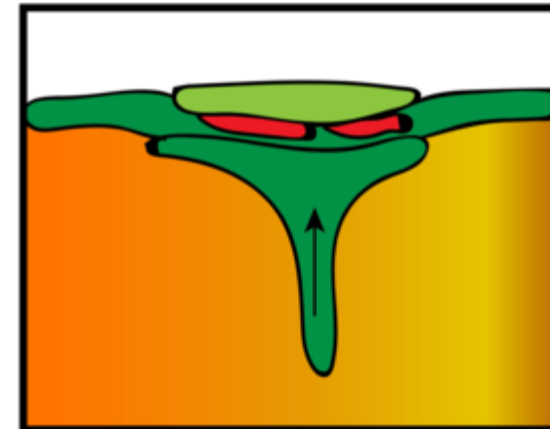
Age dating has shown these rocks formed around 2.7 billion years ago (Feirn, 1977)

The Saganaga Tonalite is special as it is high in Quartz in plagioclase but contains very small amounts of potassium feldspar (Doe and smith 1972) (Possible TTG rock) (Winter, 2010)

Duluth complex intruded upon the Saganaga Tonalite during its formation 1.1 million years ago

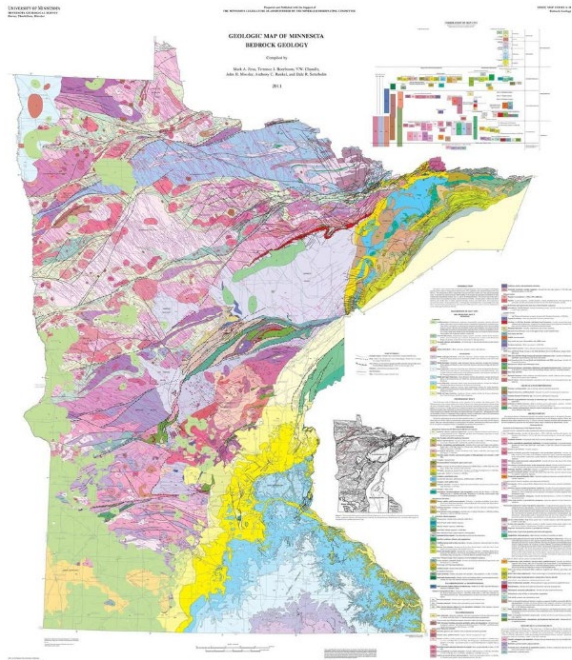


Delamination induced TTG generation

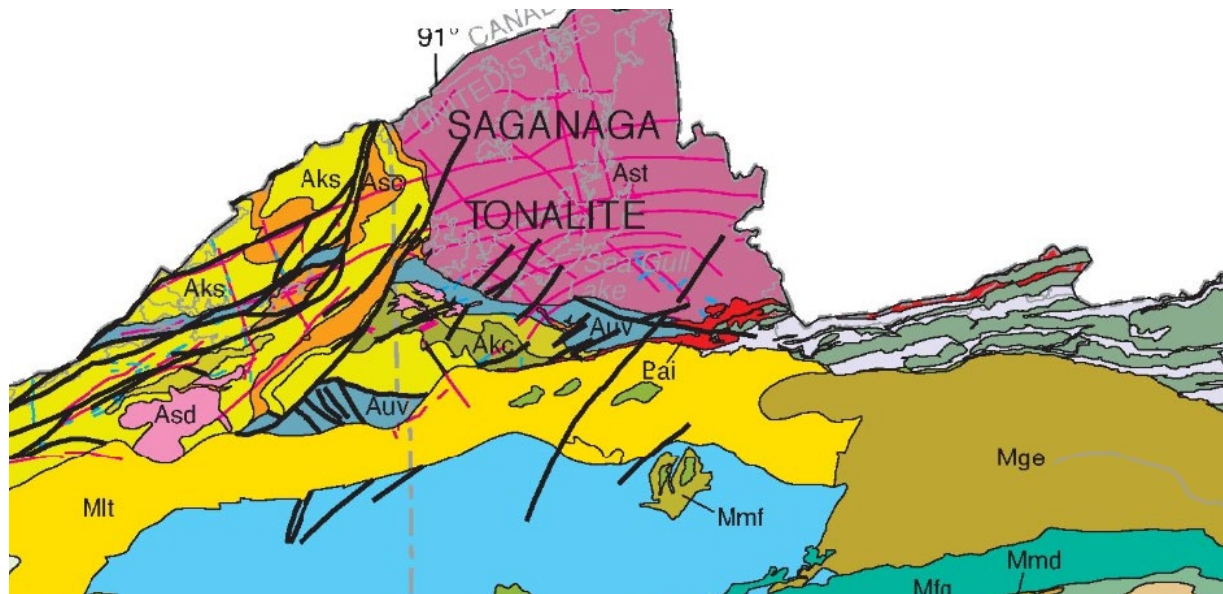
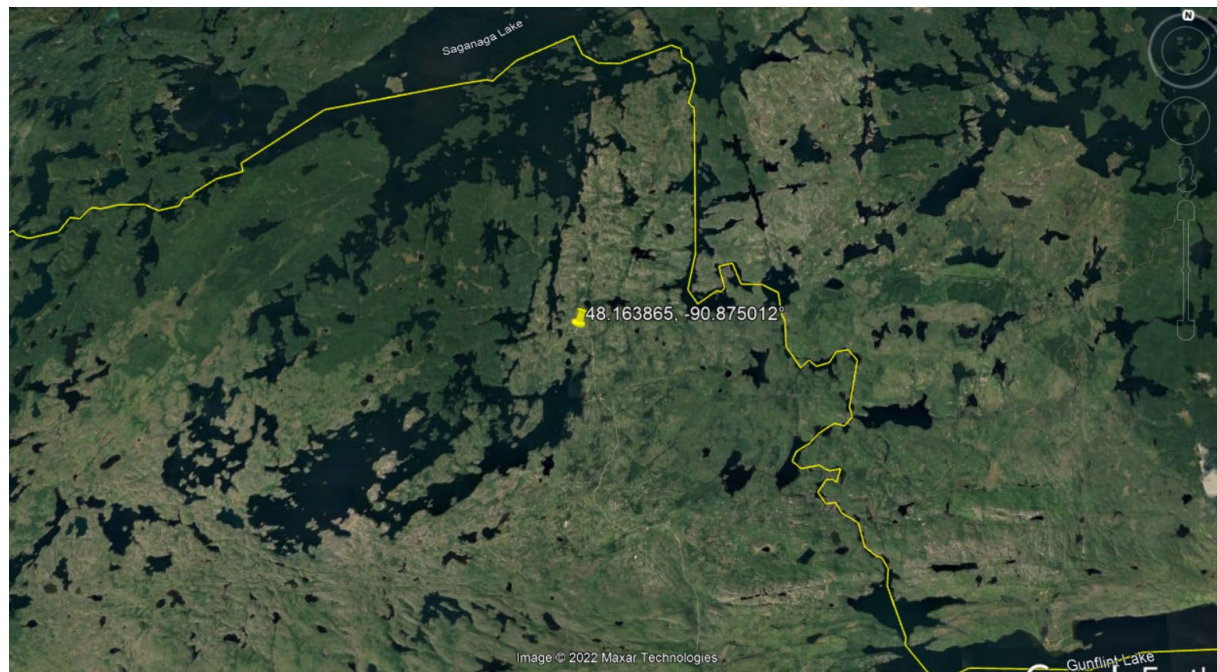


Underplating induced TTG generation

- Continental Crust
- Mafic Crust
- TTG melt
- Mantle

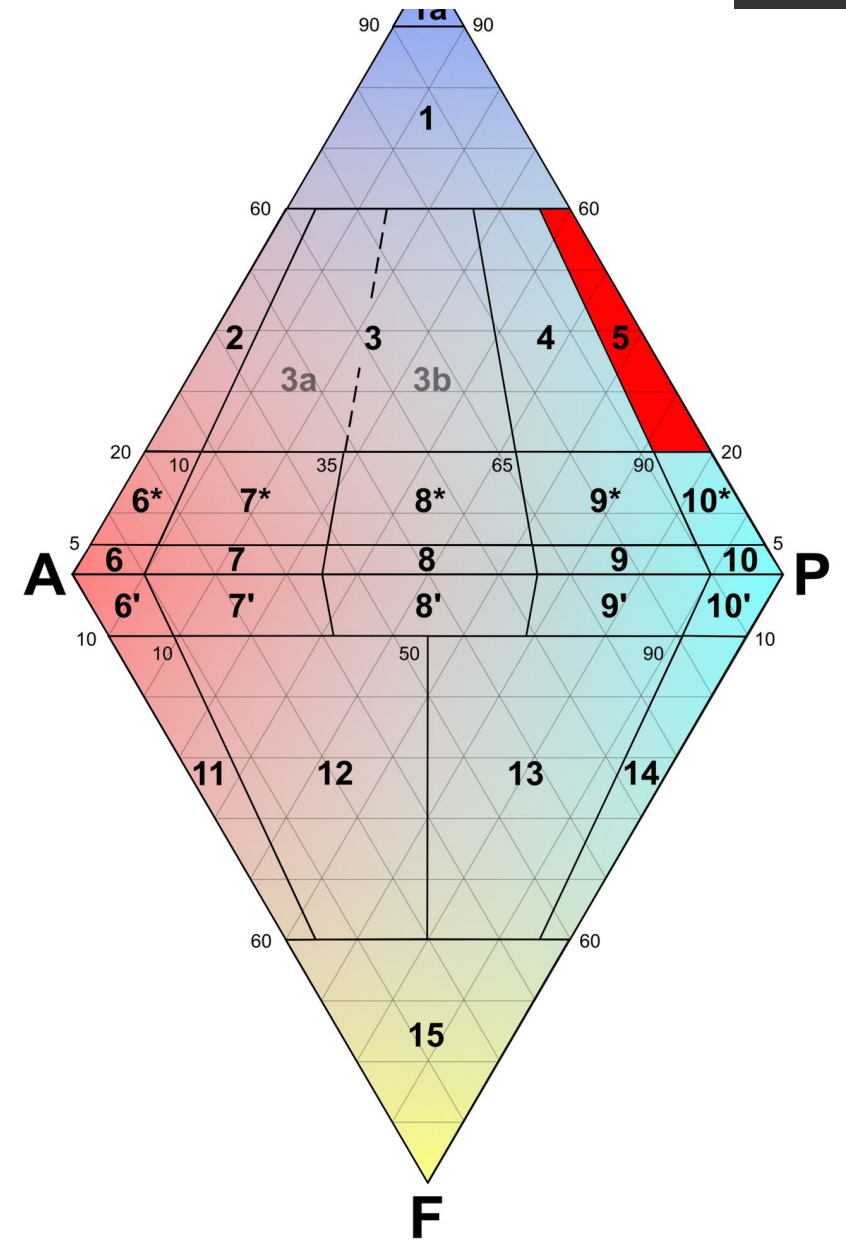


(Jirsa et al. 2011)

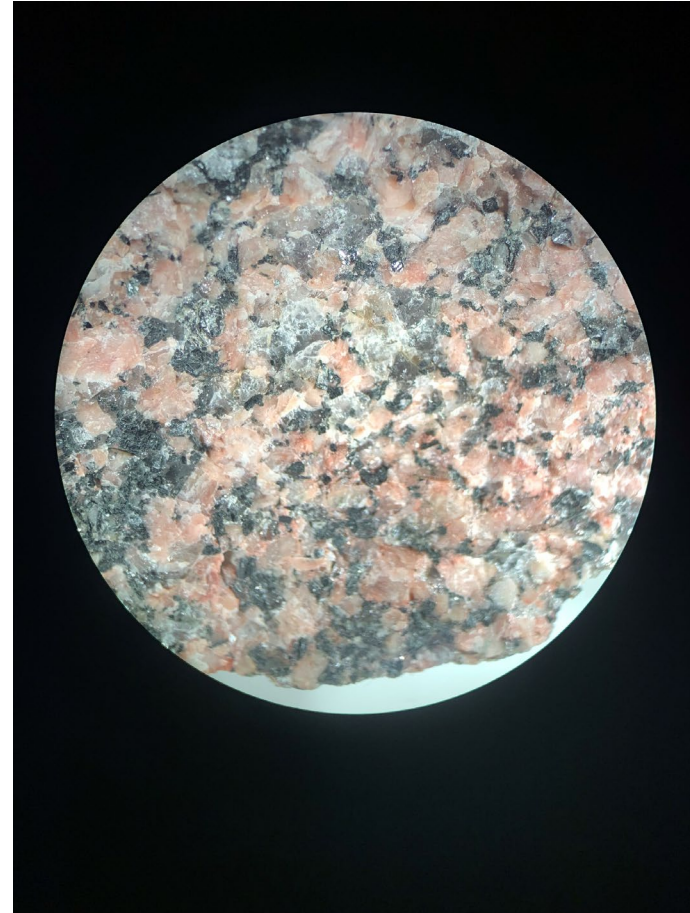


What is a Tonalite?

A granitoid (a coarse grained igneous rock with <90% mafics; felsic minerals are composed mostly of quartz (20-60%), Kspar (alkali-feldspar) and plagioclase), where plagioclase is >90% of the total feldspar on the QAPF diagram. (Mindat.org)



My hand sample



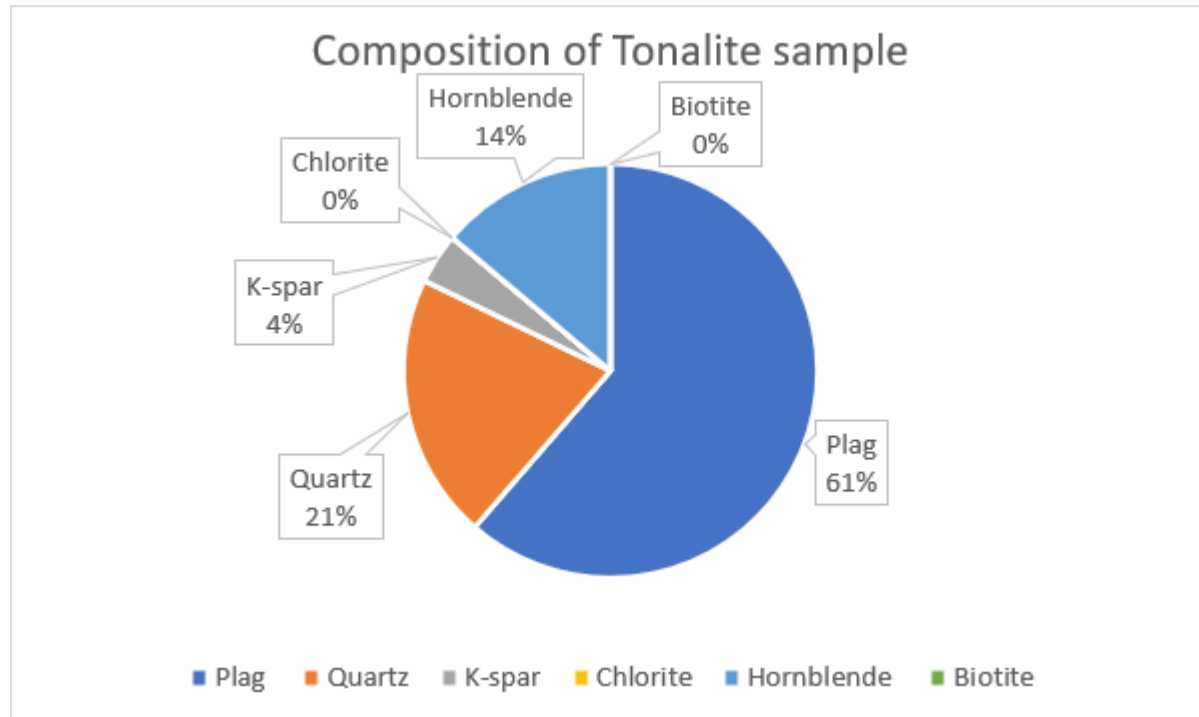
Guiding Question

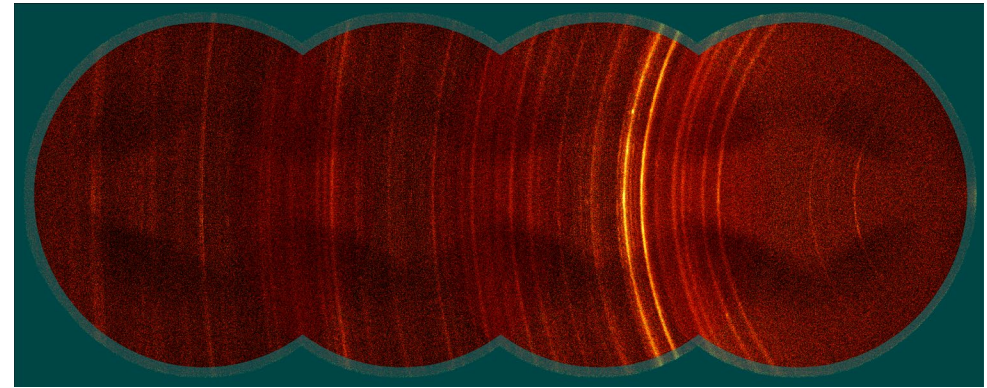
Is this rock a Tonalite and what percent K-spar is within it?

Methods

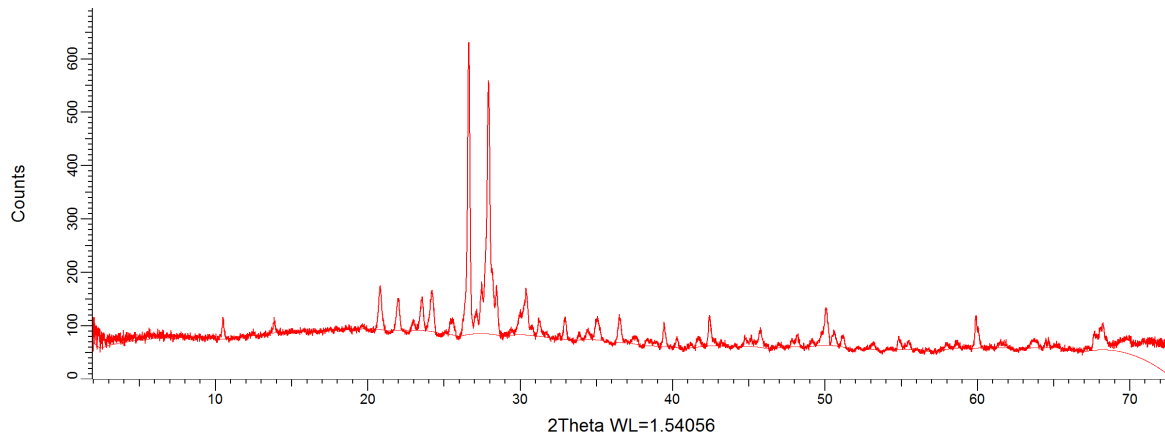
- Created thin sections of hand sample
- Conducted XRD on powdered sample using a Bruker D8, to identify minerals within
- Conducted point counting to determine composition of minerals present
- Took XRD data and conducted quantification of minerals using the Rietveld method

Point counting





X-ray Diffraction



XRD results

Minerals present via XRD:

Albite

Quartz

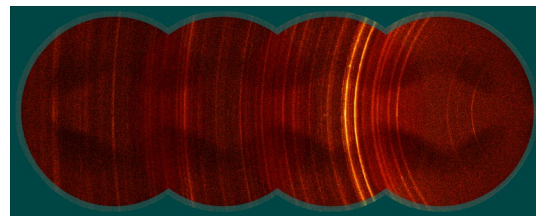
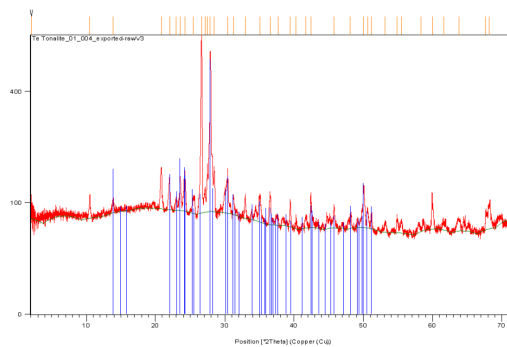
Anorthite

Biotite

Chlorite

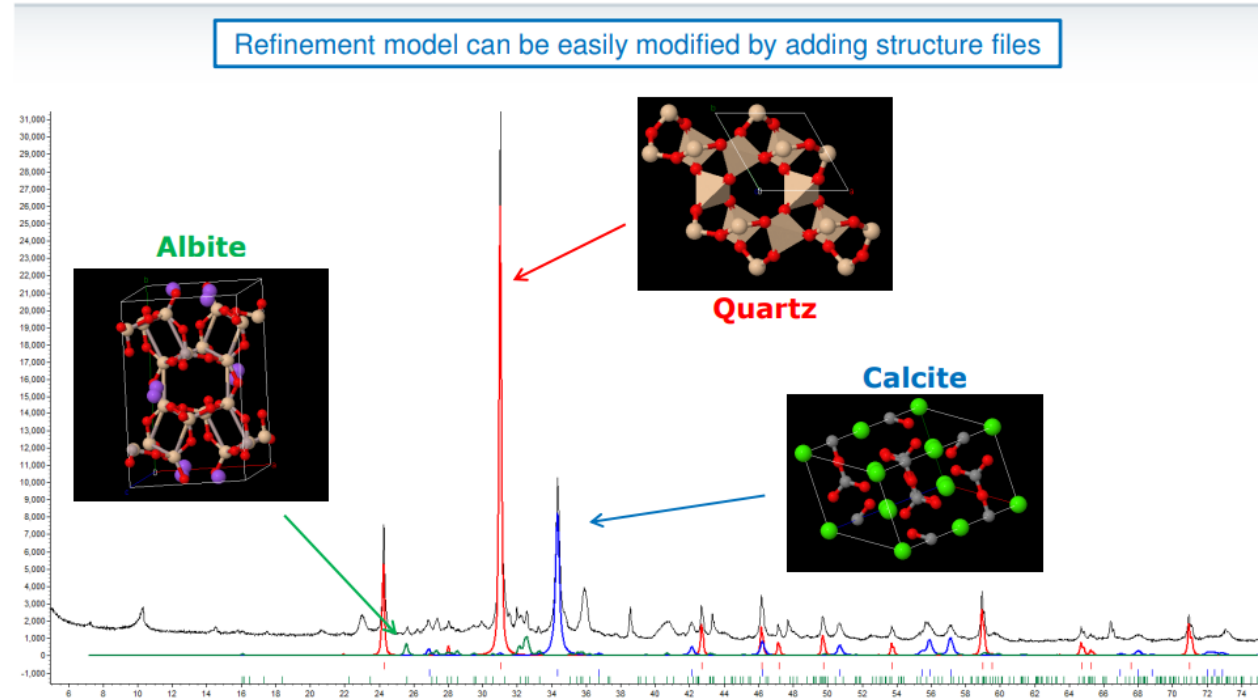
Hornblende

Orthoclase



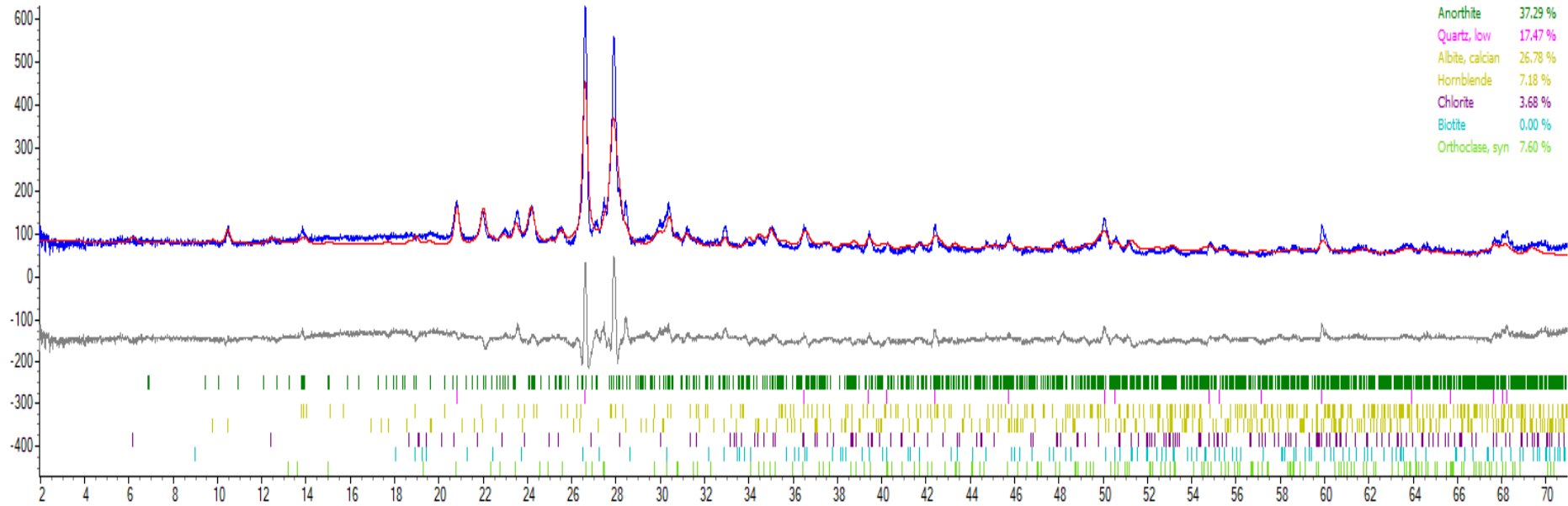
Rietveld method

- Uses crystal structures to identify peaks rather than diffraction
- Using crystal structures and the least squared method, it is able to determine the percentages within the sample



Accessed from Bruker guidebook

XRD Quantification Topas



Conclusion

