Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.20801

Reimagining automated mineralogy for the 21st century

RICH TAYLOR

ZEISS

Presenting Author: richard.taylor@zeiss.com

The phrase “automated mineralogy” has been synonymous with electron microscopy in the geosciences for decades. The use of energy dispersive spectroscopy (EDS) to rapidly map samples and identify phases of interest has gradually seen a shift out of its original industry applications and into the academic research environment. A major issue for academics wishing to take advantage of this powerful tool is the original platforms are rigid in terms of their industry designed outputs, and there has been a lack of development in both the software and hardware capable of providing automated outputs.

Using quantitative chemistry as the basis for automated mineralogy provides unique capabilities for large area analysis such as thin sections. Quantitative textural information can be extracted from the sample such as grain sizes, shapes, and mineral associations, alongside quantitative geochemical data providing mineral classification, including mineral and whole rock/sample compositions. This provides a wealth of information for the petrologist to understand their sample and a one-stop-shop for many geoscience workflows. This is a ready made mechanism to generate large datasets across multiple samples in a consistent fashion – the key to big data.

Here we show one example of greater integration of data acquisition with user generated computational software showing the power of large area quantitative EDS mapping with geoscience-oriented functions of XMapTools. By importing calibrated, quantitative EDS maps XMapTools can be used to rapidly perform a variety of petrological calculations without the need for a separate, long-winded calibration step using microprobe data. Here we use quantitative EDS from high grade metamorphic rocks to obtain mineral and bulk compositions alongside textural information such as modal abundances. These mapped data are imported directly into XMapTools and can be used to generate oxide values, cation per formula unit (cpfu), end member proportions, and perform thermodynamic calculations.