Analyses of the Button Schist of the Arctic Deposit, Northwestern Alaska

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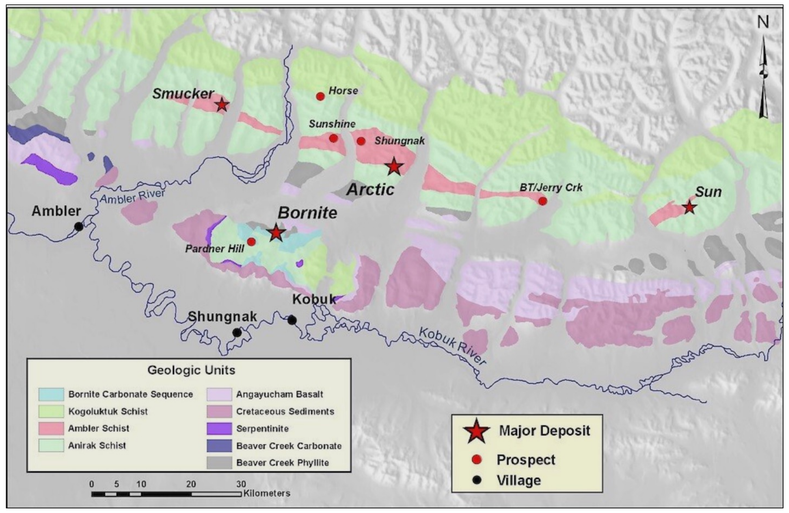
Geologic Background

The Arctic Cu-Zn deposit, located in the Brooks Range of northwestern Alaska, is a replacement type volcanic massive sulfide (VMS) prospect residing in the Ambler mining district. The Arctic deposit formed as a result of seafloor hydrothermal alteration during episodes of Late Devonian and or Early Mississipian basalt-rhyolite volcanism, mainly on extensional tectonic margins. These metamorphosed rhyolites and basalts, along with pelitic and carbonaceous metasediments make up the Ambler sequence, which plays host to a lot of the sulfide mineralization. High grade copper estimates are around 2.24%, with concentrate products including Zinc and Lead.

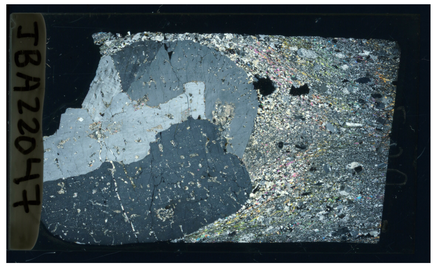
Geologic Map of Ambler Mining District



Context of Brooks Range within Alaska

Goals

This research zooms in on meta-rhyolites, specifically ones containing porphyroblasts, made up of both quartz and feldspar. These are called meta-rhyolite porphyries (MRP). The feldspar porphyroblasts exist as two different populations, one being mostly intact in most circumstances and the other being almost completely swallowed and fragmented by the matrix. Both populations show up in most samples. The goal was to find out more about the conditions and certain events that may have resulted in the creation of the button schist.



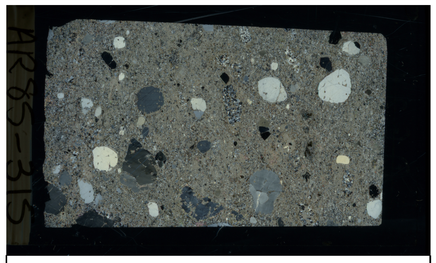
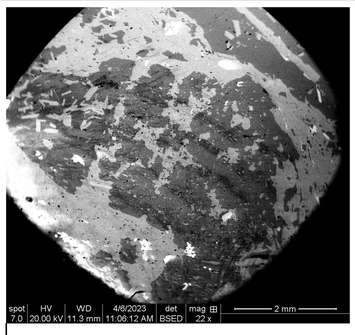


Figure 1. JBA22047, top and AR85-315, bottom, both photographed in XPL, side by side showing the variation in sizes and types of porphyroblasts in different MRPs.

Methods

Several analyses were performed in order to attempt to find out more about what might have formed the button schist. Basic petrographic examinations were performed looking at the characteristics of both feldspars, the quartz crystals, and both their relations to the matrix. Wave-length dispersive quantitative analysis of one MRP from Arctic was obtained by electron microprobe at Washington State University. The use of a scanning electron microscope at Saint Lawrence University helped us obtain backscatter electron images (BSI) of certain feldspar crystals determining whether there was any prominent patterns of zonation within these crystals.



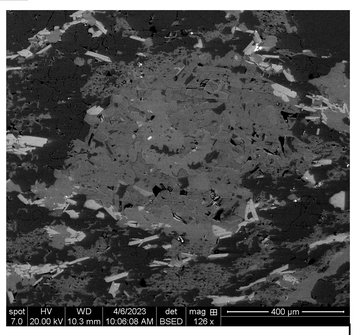


Figure 2. Examples of slight zonation of samples AR201-47a, left, and AR85-315, right. Both are back-scatter electron images.

Discussion

Extensive petrographic examination resulted in many observations of porphyroblasts, matrices and relations between them. Sample AR85-315, seen in both figure 1 and 2, is a great display of a typical MRP. This sample has intact feldspars that show twinning, and some that seem to have had a piece grown on to another. It also posseses great examples of feldspars that have been mostly deformed by the matrix at varying degrees. Some are still existent but are completely made up of fragments of what they used to be, while some are completely dissolved and are only identified by their ghost, or the “hole” they left in the matrix. The third porphyroblasts consisting of quartz are also on full display. These crystals are only being slightly deformed by the matrix, with holes being melted in the middle of them as well as reaction rims on the outside of them. This could be indicative of silica being taken from the quartz and put into the matrix. The matrix of this sample is very fine grained. The characteristics of each feldspar and quartz crystal, and the matrices are what vary between samples. Although there was some degree of zonation in some areas, most of the prominent feldspars showed little to no zonation on backscatter images.

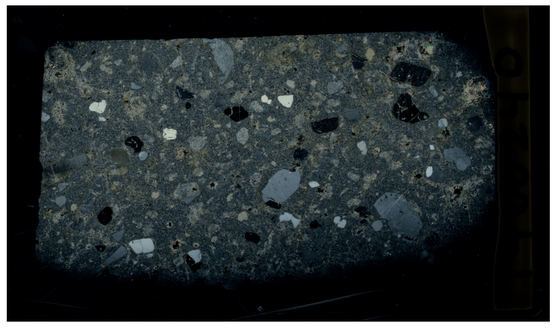


Figure 3. CMS22011, top, and 1900240, bottom. Example of matrix variation. CMS22011 shows a slightly more foliated version while 1900240, from the Snow deposit, is grainier. Both photographed in XPL.

Acknowledgments

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