Variations through the boltysh suevites: glasses, groundmass, and hydrothermal minerals

Conference or Workshop Item

VARIATIONS THROUGH THE BOLTYSH SUEVITES: GLASSES, GROUNDMASS, AND HYDROTHERMAL MINERALS

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Introduction: The Boltysh crater is a 24km complex crater in Precambrian granites of the Ukrainian shield. It contains an impact melt sheet with a 12-25m thick suevite layer above, and is infilled by paleo-lake sediments. My research involves characterising the petrology of the suevites. This will improve our understanding of their formation and how post-impact processes can change them. I have focused on the composition and alteration of the impact melt clasts, the matrix, modal abundances of mineral fragments and hydrothermal mineral assemblages.

I sampled from borehole core 42/11, which contains 12m of suevites and 4m of impact melt rock. Samples were chosen to be as representative of the core as possible, however the restrictions of having only small samples from one core are appreciated. This poster displays thin section and backscatter electron images of suevite samples and their corresponding positions within the core.

Clastic component: Mineral fragments make up the bulk of the suevites and range in size from less than 50µm up to a few cm. Polymineralic clasts are rare and occur in the lower part of the core. Fragments are angular to sub-angular and consist of sanidine, quartz, plagioclase, biotite and typical granite accessory minerals. Specks of Fe and Ti oxides occur throughout. For the purpose of this study, fragments less than 1mm are considered as groundmass, and "clasts" are 1mm or bigger. Clasts increase in size and abundance downwards towards the impact melt rock (IMR), which displays varying amounts of quartz and sanidine fragments, suggesting a gradational change to IMR.

Mesostasis: The top half of the suevite has a clay mesostasis between the mineral fragments. It fills all pore space at the top and becomes stringy downwards. Its composition is Fe-Mg rich with some Ca and variable amounts of K and Na. Occasionally it displays plagioclase quench crystallites and blocky rims around carbonate areas, and its general appearance is globular. Texture between the mesostasis and carbonate suggests that both were once melts. The groundmass of the bottom suevites is clast and mineral fragment-rich.

Glasses: Glasses transitions from pale brown, highly altered glasses to black opaque clasts with only minor alteration. These lower glasses display elongate flowing shapes as well as smaller angular shards. They are also highly vesicular. Devitrification of glasses increases downwards through the core. The composition of the freshest glasses is heterogeneous at micron scales.

Hydrothermal minerals: Hydrothermal deposits occur in all but the top 2m of core, where they may have been removed by later-stage low-temperature alteration processes. The assemblages are typical of those derived from a granitic source, and appear in the following order downwards: K-feldspar, smectite clays, zeolites, carbonate, pyrite and chlorite. The composition of the smectites is most consistent with saponite, and occurs as blobs and lining fractures and veins. Pyrite occurs within the matrix in the lower half of the suevites, between the mineral fragments. The others are restricted to vesicles with impact glasses.

The suevites vary in both their primary features (distribution of melts, grain size), as well as in the type of secondary alteration that occurs as a function of depth. This variation may be surprising in such a thin layer of suevite.