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IMPACT GLASSES AND THE GROUNDMASS OF THE BOLTYSH IMPACT CRATER SUEVITES

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Introduction: The Boltysh crater is a 24km-diameter complex crater in Precambrian granites of the Ukrainian shield. Cored borehole 42/11 was drilled in 2008 into the deepest part of the crater on the west side, and retrieved 580m of paleo-lake sediments, 12m of suevite and 4m of impact melt rock. For this study I have characterized the glass clasts and groundmass of the suevites from the core using analytical SEM, to better understand the formation of impact melt and suevites, and the effects of post-impact alteration.

Carbonate melt: An interesting observation has been the discovery of large amounts of carbonate in the top half of the suevites. It occurs in the matrix along with silicate mesostasis. Textures suggest carbonate-silicate liquid immiscibility similar to textures seen in the Haughton impact crater [1]. It differs from hydrothermal calcite deposits that occur within vesicles in the central part of the core- hydrothermal calcite forms euhedral crystals visible in hand specimen, whereas the matrix carbonate is microcrystalline. Initial compositional analysis shows that the matrix carbonate is higher in Si, Al and Fe than the hydrothermal deposit, and textures suggest a melt origin.

Glass clasts: The suevite glasses are derived from quenching of melts produced by whole rock and selective mineral melting of the target rock. This is seen by the occurrence of lechatelierite, mixed feldspathic melts, and suspected carbonate melts. Glasses are heterogeneous at a micron scale, with large variations within individual clasts. Alteration to phyllosilicates decreases downwards. Glasses in the bottom half are black and display both long, flowing, vesiculated forms up to a few decimetres long, as well as smaller, angular glass shards a few mm long.

Groundmass: The top 7m have a mineral fragment groundmass with a clay mesostasis in between. BSE images show that this clay mesostasis has textures indicative of an impact melt origin, similar to those documented in the Ries surficial suevites [2]. Textures include a globular appearance throughout, blobs of silicate within carbonate and vice versa, mineral fragments within the globules, spherules, and acicular/skeletal plagioclase quench crystallites. With increasing depth, the mesostasis changes from filling all available pore space to simply wrapping around mineral fragments before disappearing entirely. The bottom part of the core has a fragmental matrix with no interstitial material.

The mesostasis results from alteration of melt by water from the paleo-lake. This is further evidence that some pervasively altered Ries surficial suevites were altered by pooled water over extended periods of time [3]. The type of alteration and resulting products may therefore be more important in the impactite classification process than their location relative to the crater rim, as crater fill suevites from Boltysh resemble surficial suevites from Ries due to low-temperature post-impact alteration.

References: . [1] Osinski G.R. and Spray J.G. 2001. *Earth and Planetary Science Letters* 194: 17-29. [2] Osinski G. R. Grieve R.A.F and Spray J.G. 2004. *Meteoritics and Planetary Science* 39: 1655-1683 [3] Osinski G.R. 2005. *Geofluids* 5: 202-220.