6.1.P08

Ion microprobe investigation of trace elements abundances in impact glasses from the Zhamanshin crater

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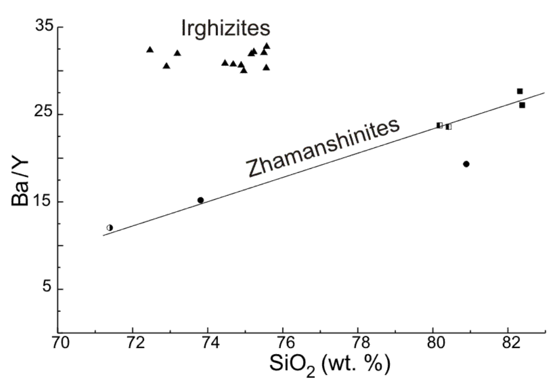
Impact glasses, irghizites and zhamanshinites, from the Zhamanshin crater have been analyzed in-situ by ion microprobe to determine the trace and REE composition. Irghizites are markedly different from acid zhamanshinites in their content of a number of trace elements. This is due to a combination of factors: liquation of the primordial impact melt (separation of Ti, Zr, Nb, Ca, Mg, Fe) and subsequent participation of this melt portion to form irghizites; contamination of irghizites by meteoritic matter (the increase in Ni, Co, Cr abundance and the different Cr/V ratio); and the special conditions of irghizite formation (removal of the volatiles B, Na, K). Ratios of some trace elements (e. g. Ba/Y, Figure) suggest that irghizites and zhamanshinites could not differ from each other as a result of the difference in the composition of the target rocks. The Zhamanshin crater was formed by two impacts close in time. The material formed by the second impact can be distinguished from that of the first impact. Irghizites produced by the second impact show traces of meteoritic matter. Irghizites also exhibit a complicated pattern of trace element zoning. They show a marked similarity to tektites found elsewhere in the world relative to the F/B ratio and the B content.



6.1.P09

On the shock behavior of anhydrite

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Hypervelocity impacts into sedimentary targets may liberate large amounts of gaseous species such as CO_2 and SO_x. It is generally accepted that release of these gases by the Chicxulub impact event drastically changed the Earth's radiative balance and climate, and increased rain acidity. These effects are the major reason for the the K/T mass extinction. To quantify the SO_x amount released during the Chicxulub event, we (1) performed high-explosive shock experiments with single crystal and powdered anhydrite in the pressure range from 12.5 to 85 GPa, followed by post-mortem studies; (2) investigated the clast population of core samples from wells Yaxcopoil-1, Chicxulub-1, and Yucatan-6; (3) constructed newly the phase diagram for anhydrite.

(1) Recovered samples display X-ray powder diffraction (XRD) patterns fully compatible with the anhydrite structure; peaks from decomposition products were not observed. Line broadening increases up to the 46.5 GPa sample, then decreases; the XRD pattern of the 85 GPa sample resembles that of unshocked anhydrite. Transmission electron microscopic studies refine this observations: mechanical twins and numerous dislocations are the dominant lattice defects; the 85 GPa anhydrite shows a recovered microstructure. (2) Textural features of the Chicxulub impactites vary strongly. Due to their extreme formation temperature, impact melt rocks mostly lack sulfate clasts – they are thermally dissociated. Melt breccias contain either (a) mineral assemblages with Ca-rich pyroxene and plagioclase, evidencing $CaSO_4$ dissociation, or (b) large anhydrite clasts showing corroded margins. They consist of equant-sized, defect-free crystals with 120° triple junctions, indicative for incomplete dissociation and solid-state re-crystallization. Other breccias from shallower and apparently, colder levels only contain anhydrite clasts, still displaying sedimentary textures. Our observations substantiate the high resistance of anhydrite to shock compression; only where high post-shock temperatures are realized, devolatilisation occurs. (3) Modeling indicate that non-porous anhydrite melts at pressures between 80 and 90 GPa, and incipient decomposition starts at 60 to 70 GPa if gaseous products can escape. The slow kinetics of decomposition near to the melting point currently hamper a properly modeled assessment of impact-related SO_x release.