Alteration patterns of impact glass spherules in the Chicxulub K-Pg event bed at Beloc, Haiti

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Chicxulub event deposits occur world-wide in different settings but only few sites still contain ejected pristine impact glass [1] [2]. We have investigated glass spherules from one of this rare locations, i.e., Beloc, Haiti, using optical and electron microscopy, electron microprobe and in-situ LA-ICP-MS.

The mm-sized spherules are partly or totally altered to poorly crystallized smectite but original textural features are well preserved. The average trace element composition of glass matches that one of the upper continental crust. Hints for a "meteoritic component" are lacking (Ni/Cr <1.3; Pt below detection limit). Compared to fresh glass, smectites are strongly depleted in REE (sub-chondritic abundances) and other trace elements, except for Li, Sc, V, Ni, Ga, Ge, and Ba. We observe in the semectite a positive Eu and a strong negative Ce anomaly; the latter is explained by formation of an organic Ce^{4+}-complex, soluble under reducing conditions. Zr/Hf of glasses and smectites is chondritic to super-chondritic (35 – 40), whereas Nb/Ta in smectite is sub-chondritic (5 – 12) compared to Nb/Ta in the glass (~ 14 – 18). The low Nb/Ta is due to the low Nb concentrations in the smectite. This alteration of impact glass to smectites at low temperature occurred in an open seawater-rock-system, but was incomplete – relic glass cores are present. These chemical changes accompanying the alteration are related to pH, f_{O2}, and the low adsorption capacity of the very fine-grained smectites having a low degree of crystallinity.

We have documented for the first time a signifcant change in diagnostic elemental ratios during alteration of ejecta spherules – this has to be taken into account in the interpretation of geochemical data of impact materials but is also of interest for alteration of volcanic glass.

[1] Schulte P. *et al* (2010) *Science* **327**: 1214-1218. [2] Smit J. (1999) *Ann. Rev. Earth Plan. Sci.* **27**: 75–113.