Formation and characteristics of impact glasses from the Lake Bosumtwi, (Ghana), and Chesapeake Bay (Virginia) impact craters: chemical constraints

Alex, Deutsch[1] Falko, Langenhorst[2] Sabine, Luetke[1] Jasper, Berndt[3]
[1]Institut f. Planetologie, Univ. Münster, Germany [2]Bayerisches Geoinstitut, Univ. Bayreuth, Germany [3]Institut f. Mineralogie, Univ. Münster, Germany

Different types of mineral and rock melts originate in impact processes. After cooling/quenching we find "impact glasses" in different geological settings in, around, and far off an impact crater. To better understand formation processes of the various glassy materials, we have chemically characterized materials that originated in the Bosumtwi (suevites, fall back particles, Ivory Coast (IVC) tektites and microtektites), and Chesapeake Bay impact events (suevites and Bediasites - North American tektite strewn field); in addition, typical source rocks were analyzed. We have used (Univ. Münster) electron microprobe (5 μm defoc. beam) for major elements, LA-ICP-MS for trace element (spot diameter 60 μm), and TIMS for Sr-Nd isotope analyses, and (Univ. Jena) XRF for trace and major elements, and DEGAS (thermogravimetry and quadrupol MS; Univ. Jena) for gaseous species.

Both tektite types are remarkably homogeneous, internally as well as the whole group, their rare earth element (REE) distribution patterns are similar to that of the average upper crust. Moreover, they are exceptionally dry (Bediasites contain 20-30 ppm H_2O, traces of CO; IVC tektites: ˜100 ppm H_2O, traces of CO_2 and CO with $CO/CO_2 > 1$; gases are released at very high temperatures). The groups of fallback melt particles and microtektites show more compositional variations although individual spherules are composed quite homogeneously. The glass shards in suevites display a rather wide compositional range, and they are relatively rich in volatile components (˜3 % wt.% H_2O, mainly released below < 300 °C; ˜0.28 % CO_2 and SO_x).

The data indicate that (i) tektites have experienced the highest temperatures (probably flash heating) under highly reducing conditions followed by fast quenching; the chemical homogeneity probably reflect more the melt/ejection process than homogeneity of the precursor materials, (ii) the composition of glass shards in the suevites reflect heterogeneities in the target, the glasses also were formed at quite high temperatures (as documented by melted accessory phases), yet incomplete loss of volatiles as well as the presence of crystallites point to a different T-t path. Fall-back spherules and microtekites may have been formed by condensation; chemical variations are ascribed to properties of the precursor materials. Based on the presence of quench crystals, the microtektites obviously have cooled slower than the fallback material.

→

Abs. No. **343**
Meeting: **DMG 2008**
submitted by: **Deutsch, Alex**
email: **deutsca@uni-muenster.de**
date: **2008-05-31**
Req. presentation: **Poster**
Req. session: **S03**