Giuli et al.: Fe oxidation state in microtektites, American Mineralogist NovDec 2013, AM-13-1111

Supplementary data

In order to further check whether the NA microtektites suffered significant alteration, water contents were measured by Fourier Transform Infrared Spectroscopy and water content maps have been obtained for selected microtektites from DSDP94 and DSDP612 cores.

The samples for the FTIR measurements were prepared as 100 to 430 μm thick double polished slides. FTIR micro-spectroscopy was performed using a standard vacuum Michelson interferometer coupled to an IR microscope inside a box purged in dry nitrogen. The source was a globar Mid-IR source and the detector was a photoconductive nitrogen cooled Mercury Cadmium Telluride (MCT). The samples were mounted on a ZnSe polished window and placed in the focal plane of the IR microscope on a micrometric stage, where it was scanned in transmission mode with a slit aperture size of 50 μm and a 15X objective/condenser setup. The reference spectra were taken on the same ZnSe substrate.

Each spectrum was recorded in the Mid-IR frequency range, averaging N=256 scans at 2 cm^{-1} spectral resolution. The absorption band in the 3200-3600 cm^{-1} region is related to the O-H stretching mode in confined water and the area under this peak can be directly linked to the water content in the compound.

Water contents were calculated according to the procedure by Gilchrist et al., (1969) following a standard application of the Lambert-Beer absorption law. The extinction coefficient used (74.8 $cm^{-1}mol^{-1}$) is in agreement with those used by Gilchrist et al. (1969) and Koeberl and Beran (1988). The density used for the water content calculation has been calculated according to Lange and Carmichael (1987) using the compositional data reported in the paper and glass transition temperatures calculated according to Giordano et al. (2008). The densities thus calculated range between 2.342 to 2.516 g/cm^3, in agreement with published densities of tektites from the NA strewn field (O'keefe, 1976; King, 1964).

The micro-FTIR transmission spectra display an absorption band with a maximum at 3600 cm-1, which is related to the total water content of the sample and whose intensity can be used to quantify the water content variation. The frequency position of the absorption band is consistent with that already reported by Koeberl and Beran (1988), as is the asymmetry of the band and the full width at half maximum. The calculated water contents of selected spots are reported in Table 1 along with the used values of density, sample thickness and extinction coefficient.

Also tektite samples from the North American Strewn field (already reported in Beran & Koeberl, 1997) have been measures for comparison. Their densities have been calculated following the same procedure for the microtektite samples. The data reported here for the north American tektites show a good agreement with previous data reported in the literature (Beran and Koeberl, 1997).

The microtektites analysed display no significant variations of the water content in going from the core toward the rim of the spherules. The determined water contents of these microtektites fall within the range of tektites from the same strewn field. The lack of significant water enrichment in microtektites, with respect to tektites, further reinforces the suggestion that these samples are not altered and the determined Fe oxidation state are not the result of sea water alteration.

References

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Table S1

name	Abs	Density 100*g/cm3	eps	Water content (ppm) this study	Water content (Beran & Koeberl 1997)
North American Tektites					
BED8402	0.147	2390	74.8	369	270 (30)
BED8802	0.218	2377	74.8	512	
BED8401	0.149	2395	74.8	347	
BEDMN8501	0.106	2392	74.8	358	300 (30)
GT02	0.050	2343	74.8	166	200 (30)
GT04	.060	2342	74.8	158	200 (30)
range				158÷512	200-300
North American Microtektites					
772-5	0.017	2429	74.8	60	
392-7	0.009	2436	74.8	34	
772-6	0.125	2348	74.8	455	
range				34÷455	