WATER CONTENT OF TEKTITES AND IMPACT GLASSES AND RELATED CHEMICAL STUDIES. Christian Koeberl (1), and A. Beran (2). (1) Institute of Geochemistry, University of Vienna, and (2) Institute of Mineralogy, University of Vienna, Dr.-Karl-Lueger-Ring 1, A-1010 Vienna, Austria.

1. Introduction

Impact glasses and tektites are rather water poor natural glasses. This was used previously to show that a terrestrial origin of tektites is problematic. Lunar glasses, however, are even more deficient in water than tektites. The average water content of tektites, which has been determined by various methods, is about 100 ppm H_2O. Similar values are unknown for extraterrestrial glasses. The problem remains, however, that the removal of water from sedimentary precursor material has to be very fast. The water content of typical parent material of tektites and impact glasses is higher by several orders of magnitude. Especially tektites are homogeneous glassy bodies without many bubbles and with low volatile element contents. The removal of these volatiles, including water, must have been very efficient and fast. Otherwise lots of bubbles would have remained in the glass. The purpose of this work is to look into the differences between several species of impact glasses and tektites.

Muong Nong type tektites are known to contain higher abundances of volatile elements, such as As, Sb, the halogens, Zn, Cu, and others. Also, they contain a larger amount of bubbles per volume than normal splash form tektites. Their Fe(II)/Fe(III) ratios are higher than in normal tektites. This has been interpreted by the senior author to show lower temperature origin and lower peak pressure during impact (1). A higher water water content would also be in line with these arguments. The interesting question of the cause of the coloured layers in the Muong Nong type tektites may also have some relation with water content. Typically, light layers contain higher abundances of almost all elements except Si than dark layers (2). We have investigated the water content of these layers to look for differences between them. This work is still in progress.

Other glasses investigated in the course of this work include samples from the Zhamanshin impact crater, USSR. It was shown by King and Arndt (3) that the water content of these glasses is higher by a factor of about five compared to normal splash form tektites. This is well in line with a terrestrial origin of these glasses. Impact glasses like the zhamanshinites or the irghizites are not as homogeneous than splash form tektites and contain more volatiles. The recently described new blue zhamanshinite variety (4) has also been analyzed for water content. This variety seems to be some intermediate species between irghizites and zhamanshinites, since it contains more siderophile elements than normal zhamanshinites, and lower volatiles than these glasses.

2. Method

The water content of the samples analyzed in the course of this work was determined using infrared spectrometry. Samples were prepared in the form of thick sections (thichness about 1mm). The instrument used was a fully computer controlled Perkin Elmer PE 580 B (with Interdata 6/16 computer), with 8x beam condenser. Accumulated scans were taken to improve the signal-noise

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ratio. Spectra were taken of regions of 1-2 mm in diameter. In the first part of the work the extinction coefficient was checked. We have used the method described by Gilchrist et al. (5) to determine the water content. Our investigation of the extinction coefficient shows that the values reported by Gilchrist et al. are usable. We have thus assumed the linear extinction coefficient to be 75 l mol^{-1} cm^{-1}. The density was assumed to be 2.4 g cm^{-3}, and the peak maximum was at 2.78 µm. Calculation of the water content was done according to the scheme described by Gilchrist et al. (5).

3. Conclusions

Since the work is still in progress at the time of writing the abstract, we are not yet able to print a results table here. First results show a water content of Muong Nong tektites to be in the range of the results reported by Gilchrist et al. (5). Our results are near 90 ppm. A small variation with the colour of the layers may be possible.

The problem of the relation between water content and volatile element content is very important. Water is one of the most volatile elements, and since its abundance in parent rocks is rather high, the removal process of water may drive out other volatiles,too. The higher abundance of water in impact glasses would be consistent with higher pressure and temperature during tektite production.

References

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