

**RAMAN SPECTROSCOPY STUDY OF TEKTITES.** M. V. Volovetsky<sup>1</sup>, A. A. Averin<sup>2</sup>, A. A. Shiryayev<sup>2</sup>  
<sup>1</sup>Vernadsky Institute of Geochemistry and Analytical Chemistry RAS, 19, Kosygin Str, 119991 Moscow, Russia, volovetsky@gmail.com; <sup>2</sup>Frumkin Institute of Physical Chemistry and Electrochemistry, 31, Leninsky Prosp., 119991 Moscow, Russia, shiryayev@phych.ac.ru.

**Introduction.** Tektites are iron containing natural silicate glasses of impact origin. They formed during a meteorite or comet impact events as a result of partial melting and evaporation of the target rocks. So tektites are important geochemical indicators of substance differentiation which is caused by impact events during formation of planets. High temperature processes in silicate melts are accompanied with redox reactions involving multi-valent elements and in the first place Fe. An analysis of the iron oxidation state in tektites is important for understanding of the conditions which take place during the impact events.

**Experiment and results.** Tektites from different strewn fields were investigated using complementary techniques such as Mossbauer and Raman spectroscopies, X-ray Absorption Spectroscopy and magnetic methods. Raman spectra were acquired for collection including various moldavites, philippinites, indochinites and australites. The spectra were recorded at room temperature using excitation by 532 and 738 nm lasers.

Typical Raman spectra of studied tektites are shown on Fig.1. The spectra are largely similar despite differences in samples provenance and composition.

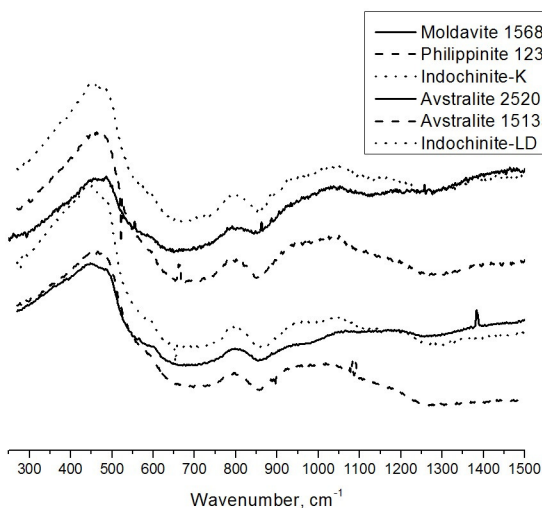


Fig.1. Raman spectra of glasses.

It is known that in Fe-containing silicate glasses the region between 800 and 1200  $\text{cm}^{-1}$  can be associated with various tetrahedral  $\text{Q}^i$  species ( $i$  – number of bridging oxygen per tetrahedrally coordinated cation). Since  $\text{Fe}^{3+}$  ions can substitute for  $\text{Si}^{4+}$  bands in this region are sensitive to iron redox state [e.g., 1].

The broad band between 900 and 1100  $\text{cm}^{-1}$  is present in all spectra. Spectral decomposition of this broad band permits to distinguish a band around 910  $\text{cm}^{-1}$ , which is supposed to be sensitive to  $\text{Fe}^{3+}$  (Fig. 2).

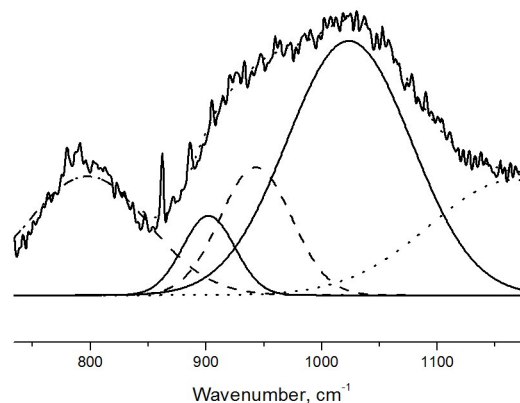


Fig.2. Deconvolution of spectra of Philippinite 1239.

In Table.1 relative intensities of the 910 band in different samples are compared with Mössbauer spectroscopy data [2].

Table.1. Relative intensity of 910  $\text{cm}^{-1}$  band (Raman spectr.) and  $\text{Fe}^{3+}/\Sigma\text{Fe}$  ratio (Mössbauer spectr. [2]).

| Sample            | 910 $\text{cm}^{-1}$ | $\text{Fe}^{3+}/\Sigma\text{Fe}$ |
|-------------------|----------------------|----------------------------------|
| Moldavite 15684   | 0.02                 | 0.11                             |
| Australite 15135  | 0.04                 | 0.13                             |
| Australite 2520   | 0.02                 | 0.09                             |
| Philippinite 1239 | 0.04                 | 0.06                             |
| Indochinite-LD    | 0.07                 | 0.10                             |
| Indochinite-K     | 0.08                 | 0.07                             |

Correlation is not unambiguous due to the necessity of calibration of the Raman data for a given glass chemical composition. Our Mössbauer data indicate low  $\text{Fe}^{3+}$  content of tektites [2], suggesting very reducing conditions during tektite formation. The present Raman results confirm this conclusion.

#### References:

- [1] Magnien V. et al. (2006) *Journal of Nuclear Materials*, 352, 190-195. [2] Volovetsky M.V. et al. (2008) *Hyperfine Interactions*, 186, 83-88.