



	<b>Experiment title:</b> Fe and Mn local structure in Muong-Nong type layered tektites by XANES and EXAFS	<b>Experiment number:</b> 08-01-304
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## Report:

Muong-Nong type tektites (MNT) are an important sub-group of tektites mainly found in Thailand and characterised by a distinctive layering, blocky shape, and big dimensions if compared to the other tektites. With the exception of two rare cases in the north-american and central-european strewn fields, MNT are exclusive of the northern part of the australasian strewn field. Layering occurs as intercalation of dark and light-coloured layers. Counterintuitively enough, the dark layers contain less Fe than the light ones. In particular, comparing the dark and light layers, the dark layers are characterised by: lower Fe and Al content, lower Refraction Index, higher Si content (Koeberl, 1992).

MNT are of key importance in the understanding of the tektite production process because of many reasons:

first, they are supposed to preserve the signature of the target rock because they are less homogeneous than normal splash form tektites; in this sense they are sometimes said to be the missing link between tektite and target rock (Koeberl, 1992 and references therein);

secondly, the layering have been interpreted either as resulting from different thermal conditions experienced by the two kinds of layers, either from the incomplete mixing of different target rocks (Glass & Koeberl, 1989; Koeberl, 1992).

This project aimed at determining the oxidation state and coordination number of both Fe and Mn in the different layers of Muong-Nong type tektites. The samples we are going to study have been already analysed for major and trace element composition, as well as, in some cases, for isotopic composition.

We collected high-resolution XANES spectra of complete set of Mn model compounds with different oxidation states and coordination numbers (Mn<sup>2+</sup> in [8], [6], [5], and [4] coordination, Mn<sup>3+</sup> in [6] coordination and Mn<sup>4+</sup> in [6] coordination) to be used as reference for the calibration of pre-edge peak energy and integrated intensity. The complete set of Fe model compounds has been already collected in previous

runs and thus only few representative standards have been collected to assure reproducibility of the spectral resolution.

High quality XANES spectra have been collected for several samples of MNT representing both dark-coloured and light-coloured layers, and the spectral features analysed and compared to those of the model compounds used. The pre-edge peak spectral features analysed all plot quite close to the tektites analysed for comparison coming from all the known strewn fields (See Figure at the bottom).

Interestingly enough, the spectra relative to the light layer reproducibly show the pre-edge peak to be at slightly higher energy (0.15 eV) than those of the dark layers. Although small, this difference is quite reproducible after several scans, and testifies a slightly higher mean Fe oxidation state in the light layers.

The Mn K-edge spectra reveal Mn to be essentially divalent and with coordination number intermediate between 4 and 5, with no systematic differences observed (possibly due to lower quality of the spectra). It has not been possible to record Mn K-edge data for all the samples due to the smaller than requested beamtime assigned.

On the whole, these data confirm the surprising uniformity so far noticed of the Fe structural role in tektite glasses, despite the striking textural, morphological and chemical differences between splash-form tektites and Munog-Nong type tektites.

These data will be discussed in term of the possible formation scenario of MNT tektites available in the literature and published along with chemical and Transmission Electron Microscope data on the same samples.

