**Fe OXIDATION STATE IN MICROTEKTITES FROM THE TRANSANTARCTIC MOUNTAINS.** G. Giuli[1], M. R. Cicconi[1], S. G. Eeckhout[2], E. Paris[1], G. Pratesi[3], and L. Folco[4]. [1]Geology Division, University of Camerino, Italy; gabriele.giuli@unicam.it. [2]European Synchrotron Radiation Facility (ESRF), Grenoble, France. [3]Dip. Scienze della Terra, Università di Firenze, Italy. [4]Museo Nazionale dell'Antartide, Università di Siena, Italy.

**Introduction:** Asteroid or cometary impacts onto the Earth surface are known to have played an important role in modifying the composition of the earth crust. Impact glasses, resulting from the rapid cooling of the molten target rock, are clues of the complex melting and metamorphic processes taking place during an impact.

Tektites and micro-tektites are a sub class of impact glasses formed during the very first stages of the cratering process by high temperature melting of the target rock. They usually display rounded shapes and can be found over wide areas called strewn fields.

As Fe oxidation state could be a useful probe to obtain information on the formation conditions of tektites, it has been the focus of many studies. However, the difficulties in analysing samples with small dimensions and high Fe dilution have so far hindered the possibility to systematically study the Fe oxidation state in these glasses. To this aim, XAS is an ideal technique as it allows to determine Fe oxidation state also in small samples even at very high dilution without deteriorating the error in the $Fe^{3+}/(Fe^{2+} + Fe^{3+})$ ratio.

**Experimental:** Iron oxidation states and coordination numbers have been determined by X-ray Absorption Near Edge Spectroscopy (XANES) on a wide set of possible impact glasses from the Transantarctic Mountain region. The XANES data have been collected at the ID26 beamline of the ESRF storage ring (Grenoble, F) using a Si(311) monochromator and with a beam size at the sample of 55 x 120 µm. Accurate analysis of the pre-edge peak energy position and integrated intensity, allowed to accurately determine Fe oxidation state in the samples studied [1].

**Results:** Tektite glasses display $Fe^{3+}/(Fe^{2+} + Fe^{3+})$ ratios close to 0.05 (±0.03). No significant variations have been found according to impact age, target rock composition [2]. Even for very large impacts events, tektites have been homogeneously reduced from a presumably wide range of Fe oxidation state in the target rock down to almost exclusively divalent [3]. Similar behaviour has been observed in molten rock from the first atomic bomb test (Alamogordo, USA) [4].

Microtektites display a more complex behaviour: while microtektites from the Australasian and Ivory Coast strewn fields display a very narrow distribution of $Fe^{3+}/(Fe^{2+} + Fe^{3+})$ ratios, microtektites from the large Cheasapeake impact show a wide variation in the Fe oxidation state raising the issue of a possible differences in the formation mechanism of tektites and microtektites [5].

Analysis of a wide set of possible impact glasses from the Transantarctic Mountain region [5] allowed to obtain XANES spectra of good quality. Despite the wide compositional differences of the samples selected for this study, very little variations have been detected in the pre-edge region. The determined Fe oxidation states clearly display a narrow distribution similar to tektites and microtektites from the Australasian or Ivory coast strewn fields (Fig. 1). The low values of the Fe oxidation states and their narrow distribution further reinforce the suggestion that these glasses are microtektites rather than other kinds of impact glasses.

Data so far acquired on these sample are consistent with XAS data of Australasian microtektites.

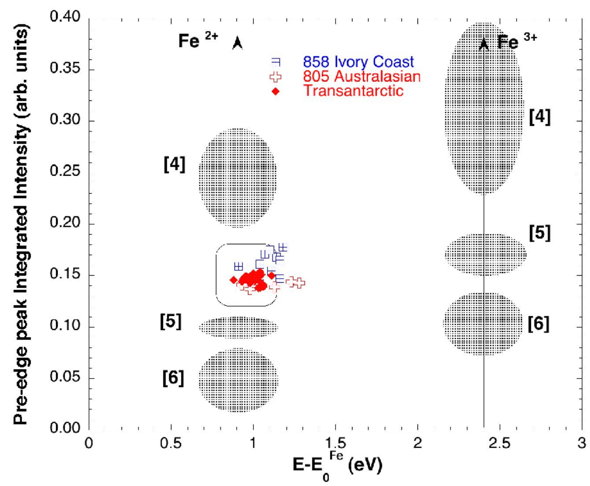


Fig. 1: Plot of the pre-edge peak integrated intensity vs. centroid position. Shadow areas are derived from Fe model compounds analysed here and elsewhere. The red diamonds represent the Transantarctic samples and they display a narrow distribution similar to tektites and microtektites from the Australasian or Ivory coast strewn fields.

**References:**

[1] Giuli, G. et al. (2011) American Mineralogist, 96(4), 631-636. [2] Giuli, G. et al. (2002) Geochimica et Cosmochimica Acta, 66(24), 4347-4353. [3] Giuli, G. et al. (2010) Geological Society of America Special Paper, 465, 653-660. [4] Giuli, G. et al. (2010) Geological Society of America Special Paper, 465, 645-651. [5] Folco, L. et al. (2008) Geology, 36, 291-294.