

## XAFS study on Zr local structure in natural glasses and tektite

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The local structures of tektite and natural glasses were studied by Zr K-edge X-ray absorption near edge structure (XANES) and extended X-ray absorption fine structure (EXAFS) in order to provide quantitative data on bonding distances and coordination numbers. The XAFS measurements were performed at the beam line BL-NW10A of the PF-AR in National Laboratory for High Energy Physics (KEK), Tsukuba, Japan. Zr<sup>4+</sup> ion in tektite have different kinds of coordination environment comparing with rock forming minerals. Various natural glasses are formed under different physical conditions. Impact-related glass, fault rocks, fulgurite and volcanic glasses are typical nature glasses. Sometimes, it is difficult to distinguish them because of their similar appearance and chemical composition. Analysis of local structure is help to compare their formation conditions and distinguish them. Tektite is a kind of impact-related silicate glass. Glass structure is affected by the pressure and temperature conditions existing during the glass formation and annealing process. This study indicated that different generation process of natural glasses gives different local structure of cation.

In order to interpret the Zr XANES spectra, the comparison between crystalline reference minerals and natural glasses is done. Comparison with other natural glasses shows that pre-edge peak heights and shoulder width are changing. The natural glasses are formed under different temperature and pressure conditions. Tektites are produced by impact event and experienced high temperature and high quenching rate presented low coordination number environment and shorter bonding distances than other glasses [1].

Zr K-edge XANES spectra of tektite had the double post-edge peaks with different heights and looked like the high temperature glass. Pseudotachylite fault rock, fulgurite, volcanic glasses and other impact-related glasses such as impactite possessed more simple local structure. Tektites are among the "driest" rocks, with average water content of 0.005%. The average coordination number of Zr<sup>4+</sup> is between 6 and 7. The eight-coordinated Zr<sup>4+</sup> shows different XAFS pattern in natural glasses.

Keywords: local structure of Zr, natural glass, tektite, XANES, EXAFS