Titanite from the Fish Canyon Tuff: Searching for clues to pre-eruptive magma chamber processes

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Magma-mixing is thought to be an important mechanism for initiating large-scale pyroclastic eruptions, and as such, may play a key role in the petrogenetic history of such eruptions. However, the fragmental and often glassy nature of pyroclastic deposits, and to some extent the homogenisation associated with emplacement at the surface, may act to mask the details of plutonic level petrogenesis. The deposits rarely display visible evidence of pre-eruptive mixing, and unless there is textural or geochemical alteration of phenocrysts prior to eruption, then evidence of mixing at depth may be very sparse.

Titanite is a geochemically robust accessory mineral that has the ability to serve as a sink for trace elements; the REE and HFSE in particular. Recently, it has been shown that compositional zoning of titanite from plutonic rocks can preserve a record of the changing conditions within a magma chamber, including evidence of magma-mixing processes [1].

This study aims to assess the ability of titanite found in volcanic rocks to preserve evidence of pre-eruptive petrogenetic processes, by conducting a coupled micro-textural and geochemical analysis of titanite from the Fish Canyon Tuff, Colorado, USA. It is thought that thermal rejuvenation of the silicic magma, caused by intrusion of mafic magma at the base of the magma chamber just prior to eruption of the tuff, served as a trigger for eruption [2]. Such an input of mafic magma could induce compositional, temperature, and oxygen fugacity changes in the chamber, to which titanite could respond

Preliminary results, from this ongoing study, show titanite to have compositional zoning with cores preferentially enriched in heavy REE and rims preferentially enriched in light REE; a reflection of the changing compositon of the melt. Dissolution surfaces with inclusions of ilmenite are common, and provide evidence of changing titanite/ilmenite stability; interpreted here to reflect changes in oxygen fugacity brought about by replenishment of the chamber with fresh mafic magma.

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Molecular and Micro Element Remote Analysis of Leaves of the Green Plants

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Condition of the vegetative ground cover is an important determinant of environmental health. The global scale of this object requires using distant, primarily optical research techniques [1].

In particular, this may be done by measuring the fluorescence spectra and laser plasma emission during leaves surfaces ablation, which allows drawing certain conclusions about the state of photosynthetic apparatus and plant vegetation conditions [2].

This study was carried out by way of remote and laboratory tests, focused on research of fluorescence spectra in photosynthetic apparatus and plasma of green plants optical-induced breakdown under femtosecond laser radiation. Radiation wavelength of $650 \div 950$ nm, peal energy up to 10 mJ, length $50 \div 100$ fs [3].

Chlorophyll fluorescence and absorption bands in the light-collecting antenna as well as the leave reaction center with the range of $660 \div 800$ nm were measured in the radiation spectra. The researched parameters helped to evaluate the current condition of plants photosynthetic apparatus.

Measurements of leaves micro element composition allow finding possible reasons which modify this condition.

Spectra of plasma emission from plant leaves located at 10 meter distance revealed the presence of sensitive spectral lines of atoms and ions of carbon, magnesium, iron, calcium, calcium, and copper. Lines of OH, Swan (C_2), and Cyanogen (CN) were also observed in these spectra.

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