Geophysical Research Abstracts
Vol. 16, EGU2014-6898-2, 2014
EGU General Assembly 2014


# From Magma Chamber to Tephra- what can volcanic titanite tell us about pre-eruptive processes?

Fiona Iddon (1), Graham McLeod (1), Tim Dempster (2), Richard Walshaw (1), and Lucie Everard (1)

(1) University of Leeds, Leeds, United Kingdom (ee11fi@leeds.ac.uk), (2) University of Glasgow, Glasgow, United Kingdom (Tim.Dempster@glasgow.ac.uk)

Large volume, apparently homogenous, crystal rich pyroclastic deposits, or so called 'monotonous intermediates' are often considered to represent erupted batholiths. Their formation and life-cycle can be preceded and eruptions triggered by highly complex magma chamber processes, with multiple periods of recharge, mixing and thermal oscillations [1]. This information is difficult to observe, even at the crystal scale due to fragmentation or re-equilibration with subsequent recharge events. Titanite is a geochemically robust mineral that acts as a reservoir for trace elements, in particular the HFSEs and REEs. This ability to act as a primary control on the trace element budget of a melt [2], coupled with its refractory nature, allows titanite to preserve compositional zoning, proven to act as a reliable record of magma chamber conditions even in long-lived plutons [3].

This study extends the use of titanite to volcanic rocks via a coupled micro-textural and geochemical study of titanites from the Fish Canyon Tuff, Colorado. Regarded as the largest ever recorded pyroclastic deposit, it is thought that the batholith-sized magma chamber cooled to a rigid crystalline mush prior to thermal rejuvenation via underplating mafic magma [1]. It is additionally suggested this may have acted as a trigger for the eruption [1]. Results have shown the titanites to possess trace element zoning reflecting changes in melt composition and chamber conditions. Dissolution horizons and inclusion suites additionally provide evidence for multiple changes in temperature and oxygen fugacity aiding the interpretation of pre-eruptive processes.

The study is ongoing with investigation of titanite from the Cerro Galan Ignimbrite, Argentina. The deposit again is suggested to have undergone a complex magma chamber growth and recharge history, with further proposals of multiple magma storage locations at different crustal levels [4]. The crystal zoning may provide further evidence for this, however the key aim is to look for similarities between the two different populations and gain a greater understanding of volcanic titanite.

[1] Bachmann and Bergantz. (2003) Geology 31, 789-792
[2] Wotzlaw et al. (2013) Geology 41, 867-870.
[3] McLeod et al. (2011) Journal of Petrology 52, 55-82.
[4] Wright et al. (2011) Bulletin of Volcanology 73, 1513-1533.