

Controls on trace elements in stalagmites derived from *in situ* growth in a Chinese cave

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Stalagmites provide powerful archives for paleoclimate with potential for seasonal resolution and precise chronology. Most published stalagmite records have focused on $\delta^{18}\text{O}$ as a proxy for past change, but $\delta^{18}\text{O}$ responds to multiple variables, particularly temperature, rainfall source, and rainfall amount. Separating these effects to provide unambiguous information about the past environment can be difficult, and there is a need for additional proxies that provide complementary information and allow deconvolution of the controls on $\delta^{18}\text{O}$. Trace-element concentrations show significant variability on all timescales in stalagmites, but the controls on trace elements are complex and no reliable trace-element proxies have yet been developed.

In this study we present data from drip waters and for calcites grown on glass plates under these drips to assess the controls on trace-element incorporation into stalagmites. The work was conducted in Heshang Cave in Central China, a site of existing paleoclimate work to reconstruct the Asian monsoon on millennial [1] to seasonal [2] timescales. Glass plates were replaced monthly for more than two years from January 2005 – a period that captures the unusually low summer rainfall of 2006 and therefore allows separation of the effects of temperature and drip-rate on stalagmite chemistry.

The mass of carbonate grown on the plates peaks in the summer months, regardless of the year, indicating the dominant influence of temperature rather than drip rate on growth. Changes in drip-water chemistry are relatively small during the year in this cave, but carbonate trace-element concentrations vary reflecting temperature-dependant distribution coefficients, the mass of calcite precipitated, and the growth rate. These effects can be separated to derive understanding of trace-element incorporation into stalagmites. These results will be compared to those from other caves, and from other carbonate-precipitating systems.

[1] Hu, C. *et al.* (2008) *Earth Planet. Sci. Lett.* **266**, 221-232.

[2] Johnson, K. R. *et al.* (2006) *Earth Planet. Sci. Lett.* **244**, 394-407.

A high temperature Raman spectroscopy study of glasses and melts along the GeO_2 - SiO_2 join

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Introduction

There has been growing interest in glasses along the SiO_2 - GeO_2 join due to their potential for polyamorphic transformations [1]. Here we present the results of an *in situ* Raman spectroscopy study on a series of $(\text{SiO}_2)_x(\text{GeO}_2)_{1-x}$ ($x = 30, 50, 65$ and 80) glasses, GeO_2 and SiO_2 , at high temperature in the supercooled liquid and molten states. The binary composition glasses have been extensively studied previously [1, 2]. However there are no *in situ* studies of the melts along this binary.

Results and Discussion

The results for GeO_2 and SiO_2 melts are similar to previous studies. However, for SiO_2 supercooled liquid we do not observe a narrowing of the Si-O-Si intertetrahedral angle with increasing temperature as suggested previously. However, there is considerable confusion in the literature as to the behaviour of the main vibrational band at $\sim 440\text{ cm}^{-1}$ with increasing temperature. For the binary compositions, their behaviour with increasing temperature is comparable. In the melt phase there is a shift of the main vibrational band to higher wavenumber coupled with an increase in the relative intensity of the bending/deformation vibrational modes. At the 50:50 composition, however, there appears to be a split in the main vibrational band at around 1720°C . This may indicate that there is some sort of liquid-liquid phase separation for this composition at this temperature.

[1] Majérus *et al.* (2004) *JNCS*, **345**, 34. [2] Majérus *et al.* (2008, in press) *JNCS*.