Aerosol particle phase state measurement technique using a low pressure impactor

E. Saukko*, H. Kuuluvainen and A. Virtanen

Department of Physics, Tampere University of Technology, Tampere, FI-37720, Finland
(*correspondence: erkka.saukko@tut.fi)

The phase state of aerosols has impact on the behaviour of atmospheric aerosols. Recently published results show that the atmospheric biogenic SOA particles can adopt amorphous solid phase [1]. Existing methods to resolve solvent absorption induced phase change, such as tandem differential mobility analysis rely on the size change of particles related to solvent uptake.

To study the particle phase and phase change induced by size-preserving processes e. g oxidation, a new method has been developed. The method relies on impaction of particles on a smooth substrate and subsequent counting of bounced particles by condensation particle counter [2].

An example data of bounce probability with varying relative humidity is given in Figure 1. An ammonium sulphate aerosol was cycled through the system and an almost step-like transition was seen on the bounce probability at around 80% relative humidity. This corresponds well with the known deliquescence relative humidity of 80% [3].

The bounce probability can not at present be quantitatively linked to mechanical properties of particles, but it is qualitatively informative. The method has been applied on nebulised laboratory aerosols as well as on SOA.

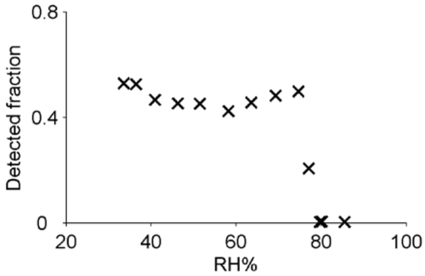

Figure 1: Fraction of 91nm ammonium sulfate particles detected after impaction with varying humidity

This work was supported by the Maj and Tor Nessling foundation.

[1] Virtanen, A. *et al.* (2010) *Nature* **467**, (7317) 824–827. [2] Saukko *et al.* (2011) To be submitted to *Atmos. Meas. Tech.* [3] Mikhailov, E. S. *et al.* (2009) *Atmos. Chem. Phys.* **9**, (24) 9491–9522.

Gold mobility in the mantle: Constraints from sulfides in pyroxenites and lherzolites

J.E.J. Saunders*, N.J. Pearson and Suzanne Y. O'Reilly

GEMOC/CCFS, Macquarie University, NSW, 2109, Australia
(*correspondence: james.saunders@mq.edu.au)

Sulfides are the host for gold in the mantle [1], yet there is a scarcity of reliable Au analyses for sulfides from different mantle rock types. As a result, the geochemical behaviour of Au in the mantle is still poorly understood. In this study Au has been measured along with major and trace elements in sulfides in the well-characterised peridotite and pyroxenite xenoliths from Qilin, southeastern China. The peridotites are spinel and amphibole-spinel lherzolites, and the pyroxenites are basaltic melts that have re-equilibrated to spinel and garnet websterites in the upper mantle [2].

Pyrrhotite with very limited variability in major-element geochemistry is the dominant sulfide in the pyroxenites. The sulfides in the lherzolites include polyphase assemblages of mainly monosulfide solid solutions (MSS) with minor millerite, hazlewoodite and cubanite. The lherzolite-hosted sulfides have substantial variation in Fe, Ni and Cu contents. Interstitial and enclosed sulfides in these samples are mineralogically and chemically identical.

There are significant differences in the Au content of the pyroxenite- and lherzolite-hosted sulfides. Most pyroxenite sulfides have Au concentrations below lower limits of detection (<200 ppb), whereas the Au concentrations in lherzolite-hosted sulfides are several times higher than detection limits. There is no systematic difference between the Au content of sulfides in samples that have been modally metasomatised (amphibole-bearing), and sulfides in amphibole-free samples.

The lherzolites are quite fertile (equivalent to ~10% melt removal [3]), but there is no consistent trend in the PGEs (average $Pd_{PUM}/Os_{PUM} = 1.49$). However Au in these samples does appear to be depleted compared with the PGEs (average $Au_{PUM}/Os_{PUM} = 0.25$). This trend in the lherzolites strongly contrasts with the Au/Os ratio in the pyroxenites, where Au is relatively enriched. This comparison between Au in pyroxenite- and lherzolite-hosted sulfides suggests that Au can be transported by melts, and these melts may play a significant role in Au enrichment in the mantle.

[1] Mitchell & Keays (1981) *GCA* **45**, 2425–2442. [2] Xu *et al.* (1996) *Lithos* **38**, 41–62. [3] Guo *et al.* (1999) *J. Petrol.* **40**, 1125–1149.