Structure of silicate melts using *in situ* high temperature X-ray absorption on light elements (Mg, Si, Al, K, Ca)

DANIEL R. NEUVILLE[1], DOMINIQUE DE LIGNY[2], LAURENT CORMIER[3], ANNE-MARIE FLANK[4] AND PIERRE LAGARDE[4]

[1]Physique des Minéraux et Magmas, IPGP, CNRS, 4 place Jussieu, 75005 Paris, France
[2]LPCML, UCBL, 12 rue Ampère, 69622, Villeurbanne, France
[3]IMPMC, Universités Paris 6 et 7, CNRS UMR 7590, 140 rue de Lourmel, 75015 Paris France
[4]SOLEIL-CNRS-PSI, Swiss Light Source, CH-5232 Villigen – PSI

Structure of silicate and aluminosilicate melts is not well known at high temperature. X-ray absorption spectroscopy is a very specific and interesting way to probe the network structure and more specifically the Al and Si surrounding.

Recent developments on X-ray absorption spectroscopy at light K-edges, made on the LUCIA beamline at the Swiss Light Source, enable to measured XANES spectra at high temperature on the Mg, Al, Si, Al, K and Ca K-edges. We have investigated crystal and melts from room temperature up to the liquidus.

All these observations on the XANES on the K-edge of light elements are correlated with simulations using FDMNES.

Origin of non-linear mass dependent fractionation in Nd

K. NEWMAN[1]*, P.A. FREEDMAN[1], J. WILLIAMS[1] AND N. S. BELSHAW[2]

[1]Nu Instruments Ltd, Unit 74, Wrexham Industrial Estate, LL13 9XS, UK (*correspondence: karla@nu-ins.com)
[2]Dept. of Earth Sciences, Univ. of Oxford, OX1 3PR, UK

Investigations of experimental skimmer cones revealed significant non-linear mass dependent fractionation in the measured Nd isotope ratios. It is proposed that the origin of this non-linear mass bias is the formation of NdO^+ at (or very close to) the skimmer surface. The degree of oxide formation, and hence fractionation, is isotope dependent but is not a linear function of mass (Fig. 1).

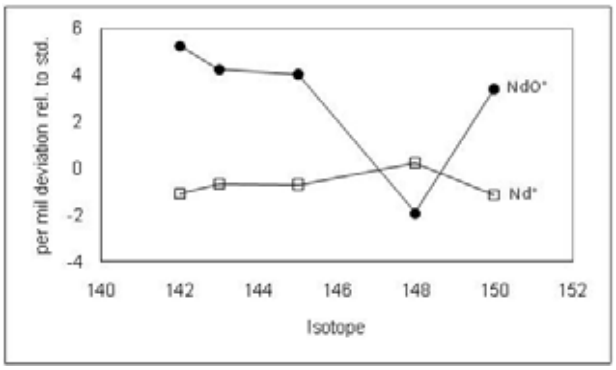

Figure 1: Normalised to 146Nd/144Nd = 0.7219 (error bars are smaller than the data points).

A decrease in the $^{x}Nd/^{144}Nd$ ratio, relative to standard values, in Nd^+ is associated with a concomitant increase in the same ratio in NdO^+ (and vice versa). The correlation between the metal and oxide species is consistent with mass balance calculations. The magnitude of this effect was dependent on conditions at the skimmer surface (geometry, surface coating, etc.) and could be suppressed by the addition of small amounts of N_2 to the carrier gas flow.

The non-linear fractionation observed is shown to correlate with deviations (from a linear function of mass) in the nuclear charge radii.

A simple energy-resonant ion-atom reaction is postulated to explain these observations. The other REEs and their oxide formation will be discussed.

Non-linear mass fractionation effects were not observed in commercially released Nu skimmers. However, non-linear contributions to the mass bias may be present in any system at very low levels (particularly in the absence of air leaks in the inlet) and could be a source of analytical uncertainty.