

## Oxide production and isobaric interference during LA-ICP-MS and SIMS analysis: The good, the bad and the ugly

A. UNGERER<sup>1</sup> AND A.J.R. KENT<sup>1,2</sup>

<sup>1</sup>W.M. Keck Collaboratory for Plasma Spectrometry, Oregon State University, Corvallis, Oregon, USA  
(aungerer@coas.oregonstate.edu)

<sup>2</sup>Department of Geosciences, Oregon State University, Corvallis, Oregon, USA

Evaluation of isobaric interferences from elemental oxides (typically  $M^{16}O^+$ ) is a necessary part of many isotopic and trace element analyses conducted by LA-ICP-MS and SIMS. In many cases interferences from specific oxide ions can seriously impair analytical accuracy. Oxygen is present in significant quantities in most geological matrices, and oxide formation occurs readily during either ion sputtering (SIMS) or particle breakdown and ionisation within the ICP plasma (LA-ICP-MS). Although the effects of oxide interferences vary widely with differing matrices and element abundance, important examples include the interference of LREE oxides on HREE, Re and W oxides on Hg, HREE oxides on PGE, BaO on Eu and TiO on Cu. Oxide production during SIMS analysis is relatively well characterized and suitable correction procedures exist. For LA-ICP-MS production rates are substantially lower (typically by a factor of ~5-10), but are less well characterized. Nevertheless, oxide production during LA-ICP-MS analysis can still compromise analytical performance, and the phenomenon of oxide production deserves a closer look.

We have measured oxide production ratios ( $M^{16}O^+/M^+$ ) via LA-ICP-MS under a variety of analytical conditions using an ArF Excimer laser (193 nm), He carrier gas, and specially prepared glasses. Oxide production rates measured from synthetic basalt composition glasses are typically between 0.01 – 2% at normal tuning conditions and broadly correlate with the M-O bond energy. As expected oxide production rates relate strongly to plasma conditions (being highest at low plasma temperatures) but also appear to vary with ablation parameters (frequency, energy, spot characteristics), probably reflecting the degree of breakdown under differing particle loads and size distributions. As with solution measurements, the relative differences between  $M^{16}O^+/M^+$  are less sensitive to plasma and ablation conditions, and offer the potential for correction procedures. Our data also allow calculation of the sensitivity of specific elements and matrices to isobaric oxide interferences. For example, our data suggest that interference of REEO<sup>+</sup> on HREE and BaO<sup>+</sup> on Eu will be apparent outside normal analytical errors for elemental analysis ( $\pm 5\%$ ) at  $[Ba/Eu]_N \geq \sim 20$  and  $[La/Yb]_N \geq \sim 50$ .

## The structure of jadeite composition melt at high pressure

S. URAKAWA<sup>1</sup>, K. FUNAKOSHI<sup>2</sup>, T. KIKEGAWA<sup>3</sup>, AND O. SHIMOMURA<sup>4</sup>

<sup>1</sup>Department of Earth Sciences, Okayama University, Okayama, Japan (urakawa@cc.okayama-u.ac.jp)

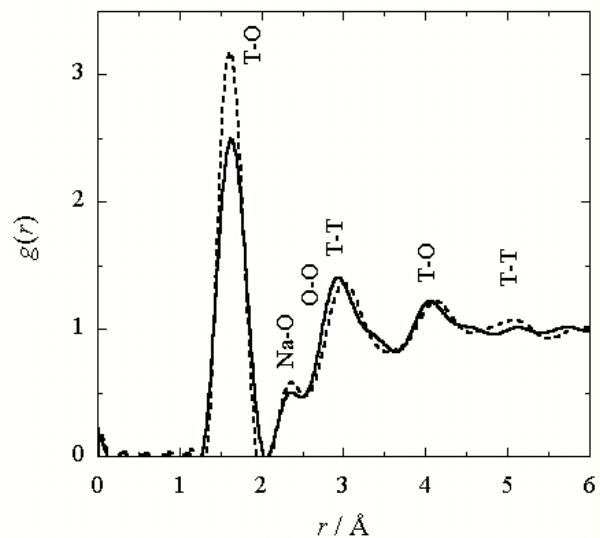
<sup>2</sup>Japan Synchrotron Radiation Research Institute, Mikaduki, Japan (funakosi@sp8sun.spring8.or.jp)

<sup>3</sup>Photon Factory, KEK, Tsukuba, Japan (takumi.kikegawa@kek.jp)

<sup>4</sup>Japan Atomic Energy Research Institute, Mikaduki, Japan (simomura@spring8.or.jp)

Structural study on the molten jadeite ( $NaAlSi_2O_6$ ) up to 3 GPa were carried out by in-situ X-ray diffraction experiments using the cubic-type high-pressure apparatus MAX 80 at Photon Factory, KEK, Tsukuba, Japan. Energy-dispersive X-ray diffraction method was applied to give the coherent scattering intensities in  $Q$  range from 1 to 12  $\text{\AA}^{-1}$ .

The correlation function  $g(r)$  for molten jadeite at 2.5 GPa and 1663K is compared with that of glass synthesized at 0.1 MPa in Fig. 1. One atmosphere jadeite composition glass is fully polymerized and its structure is explained by a stuffed tridymite model (Taylor and Brown, 1979). The  $g(r)$  shows that jadeite composition melt is also fully polymerized up to 3 GPa. The first peak intensity of high-pressure melt is significantly lower than that of glass, although the peak position (T-O distance) does not change. The peak around 3  $\text{\AA}$  indicates the T-T distance in high-pressure melt is clearly shorter than that of one atmosphere glass. These suggest that the decrease in T-O-T angle in high-pressure jadeite composition melt, results in the weakening of the framework structure, and results in the decrease of viscosity.



**Figure 1.** Correlation function  $g(r)$  of jadeite composition glass at 0.1 MPa and 298 K (dashed line) and jadeite composition melt at 2.5 GPa and 1663 K (solid line).