# A low flow desolvating nebulizer system as a tool for calibration in LA-ICP-MS

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Calibration for laser ablation inductively couple plasma mass spectrometry is a continuing challenge to analysts. Precise matrix matching is required to ensure ablation characteristics and subsequent plasma dynamics are consistent between calibrants and samples.

On-line additions of liquid standards to ablated aerosol streams has been shown to elminate the need for precise matrix matched standards and still provide good calibration.[1–4] In this paper, the authors present a technical overview of the technique of on-line additions and a comparison with traditional, matrix matched calibration for the analysis of Arkansas Womble Shale.

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# Carbon isotope constraints on degassing of MORB from the Southwest Indian Ridge (32-50°E)

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The Southwest Indian ridge is remarkable for its slow spreading rate and large radiogenic isotope anomalies. It is therefore ideal to test possible carbon isotope variations in the mantle. However, due to its low solubility in basalts, $CO_2$ is affected by strong degassing processes which must be precisely characterised before investigating compositional variation of the mantle source. In this study, we analyzed 28 SWIR basaltic glasses for their vesicularity, $CO_2$ vesicle content, and $\delta^{13}C$ of $CO_2$ in vesicles. The samples were collected on the SWIR axis from 32 to 50°E and in a range of depths from 1320 to 3850 m.

These data are discussed in the light of an improved mass balance model that takes into account: (1) variable initial $CO_2$ contents, (2) a deep degassing step, (3) isobaric loss of vesicles at crustal level, (4) the depth of magma storage in the crust, (5) the effect of crystal fractionation on degassing, and (6) the full range of degassing regimes between the magma chamber and the eruption depth (closed vs. open system degassing and equilibrium to kinetic degassing regimes).

Vesicularities show a large range: from 0 to 9.15 vol%, most samples having less than 4% vesicles. Carbon isotopic compositions of $CO_2$ in vesicles extracted by crushing in vacuo show a relatively large range of $\delta^{13}C$-values from –1.26 to –13.36‰ with most values between –4 and –8‰. The measured $\delta^{13}C$-values are similar to those observed for other ridges (Atlantic and Pacific).

The computed results show that approximately half of the dataset can be explained by a shallow stage of degassing occurring as a closed system after total loss of the first generation of vesicles in axial magma chambers. The second half of the dataset requires that the shallow degassing stage occurred as an open-system degassing process. One sample requires the stage of open-system degassing to start much deeper than 6 km depth (below sea floor) or to be strongly kinetic. The few remaining samples are best explained by kinetic open-system degassing in order to fit their relatively high $\delta^{13}C$ values.

The model shows that the mode of the last degassing step and the extent of isobaric degassing at crustal level exert a strong control on the volatile characteristics of the erupted melts, the other processes having minor effects. If carbon content and/or carbon isotopic ratio anomalies exist below the SWIR, these are either small in magnitude or masked by degassing processes.