

New constraints on the high-field-strength element concentration of NIST SRM 610 and 612 glasses

C. SPANDLER^{1*}, T. PETTKE¹, A. BERGER¹ AND C. MAGEE²

¹Institute of Geological Sciences, University of Bern, Switzerland (*correspondence: spandler@geo.unibe.ch)

²Research School of Earth Sciences, Australian National University, Canberra, Australia

We present new electron microprobe and LA-ICP-MS data on trace elements in the NIST SRM 610 and 612, MPI-DING and BCR-2g reference glasses. XRF analysis of NIST SRM 610 is currently being conducted. Results of our quantitative analysis of the NIST SRM 610 glass by electron microprobe indicate that the concentrations of many high field strength elements (HFSE) are 10 to 25% higher than the most commonly-used reference values. Based partly on our results and partly on a critical evaluation of previously published data, we present a new list of preferred element concentration values for the NIST SRM 610 and 612 glasses. The values are subdivided into four "reliability" groups depending on the accuracy and precision of the proposed values.

To test the accuracy of these new reference values we have analyzed a series of other reference materials (MPI-DING and the BCR-2g glasses) for a range of trace elements by LA-ICP-MS in two independent laboratories. Quantification of the results was achieved using NIST SRM 610 as the external standard and our preferred concentration values. The results indicate that most of our compiled values for the NIST glasses are accurate. In particular, our LA-ICP-MS results for the HFSE are entirely consistent with our electron microprobe data. We propose that our new reference values should be used in the interim as external reference values for quantification of LA-ICP-MS data. However, we also emphasize that the concentrations of many elements in the NIST SRM 610 and 612 glasses remain poorly characterized; a fact that can only be remedied by accurate determination of element concentration in these reference materials utilizing high-precision analytical techniques with independent calibration approaches.

Given the external precisions that can currently be achieved (e.g., $\pm 2\%$) with LA-ICP-MS for measurements not limited by counting statistics, such grossly inaccurate reference values have now become the limiting factor for obtaining accurate *in situ* data.

Variation of $\delta^2\text{H}$ and $\delta^{18}\text{O}$ values of water stored in PET bottles

J.E. SPANGENBERG* AND T.W. VENNEMANN

Institute of Mineralogy and Geochemistry, University of Lausanne, Switzerland

(*correspondence: Jorge.Spangenberg@unil.ch)

(Torsten.Vennemann@unil.ch)

Polyethylene terephthalate (PET) bottles are often used for transport and storage of liquid or humid material for a wide range of biological, pharmaceutical, medical, forensic, and hydrogeochemical purposes.

Permeability, sorption, desorption, diffusion and solubility of water, water vapor, oxygen, carbon dioxide, nitrogen, and methane in organic polymer films varies with film thickness, relative humidity, polymer crystallinity and temperature. Water sorption and diffusive transfer of water molecules through the wall of the PET bottle may cause isotopic exchange between water within the bottle and water vapor in air near the PET-water interface. In this study, a set of bottled waters from a single natural spring, has been used to examine the effects of storage in plastic polymer material on the isotopic composition ($\delta^{18}\text{O}$ and $\delta^2\text{H}$ values) of the water. The chosen bottled water is the natural spring water of Evian, which is distributed throughout most of the world in PET and locally also in glass bottles. This permits examination of the changes in the stable isotope composition of water stored in the same type of PET bottle, presumably produced and cleaned via the same procedures, but where the water was stored and transported within these bottles for different times and at different conditions of temperature, pressure, and humidity. 30 bottles of Evian bottled water were obtained from 27 locations in 19 countries. Changes of about +4‰ for $\delta^2\text{H}$ and +0.7‰ for $\delta^{18}\text{O}$ have been measured for water after 253 days of storage within the PET bottle. The results of this study clearly indicate the need of using glass bottles for storing water samples for isotopic studies. It is imperative to transfer PET-bottled natural waters to glass bottles for their use as calibration material or potential international working standards. All the studied Evian waters from around the world originate from the natural spring Cachat (Evian-les-Bains, France). As this natural water is mostly distributed in PET bottles, it could be an inexpensive, readily available international working standard ($\delta^2\text{H} = -74\text{‰}$, $\delta^{18}\text{O} = -10.6\text{‰}$), if transferred to glass recipients shortly after the original bottling in plastic material.