Nucleic acid bases under hydrothermal conditions by densimetry, calorimetry and UV-visible spectroscopy

VANESSA MANN AND PETER TREMAINE*

University of Guelph, Guelph, Ontario, Canada
(*correspondence:tremaine@uoguelph.ca)
(vmann@uoguelph.ca)

Partial molar volumes V° and heat capacities C_p° of aqueous nucleic acid bases, excluding guanine, and their corresponding nucleosides have been determined in acidic and neutral solutions from 15 to 90°C, using a densimeter and nanocalorimeter with methods developed by Woolley [1]. Measurements of V° for neutral cytidine, thymidine, uridine were made up to 200°C using a high temperature densimeter [2]. The results were used to derive experimental parameters for the HKF model, and a simple group additivity model for the contribution of the ribose group to the partial molar properties of nucleosides. This contribution was used to estimate the partial molar volume of guanine.

The first acid ionization constant of adenosine K_{a1} has been measured from 25°C to 250°C at 95 bar using the UV-visible spectroscopy system previously described [3]. Decomposition kinetics of neutral and protonated adenosine in solution have also been measured, and compared to the decomposition spectra of adenosine in formic acid/formate and mono-/di-hydrogen phosphate buffers. Considerable differences in thermal decomposition spectra suggest that phosphate buffer solutions interact differently with adenosine at elevated temperatures than other buffered solutions. Reaction products will be characterized from ^{13}C and ^{31}P NMR spectra.

[1] E.M. Woolley (1997) *J. Chem. Thermodyn.* **29**, 1377–1385. [2] C. Xiao, H. Bianchi and P.R. Tremaine (1997), *J. Chem. Thermodynamics* 29, 261-286. [3] J. Ehlerova, J., L.N. Trevani, J. Sedlbauer, P.R. Tremaine, (2008): J. Solution Chem. **37**, 854-857

The Öræfajökull signature

CHRISTINA J. MANNING*, MATTHEW THIRLWALL AND DAVE LOWRY

Department of Earth Sciences, Royal Holloway University of London, Egham, Surrey. TW20 OEX
(*correspondence: c.manning@es.rhul.ac.uk)

Öræfajökull lavas exhibit a geochemical signature unique in Iceland. Published data show it to have anomolously high $^{87}Sr/^{86}Sr$, $\Delta^{208}Pb$ and $\Delta^{207}Pb$ values [1,2]. Mixing with an EM type component has been suggested as the source of this enrichment [1,2]. Until now research has suggested that this EM type component is not present in basalts elsewhere on Iceland [1].

A comprehensive suite of lavas from Öræfajökull, the Eastern rift zone (Grimsvötn and Veiðivötn) and the Tertiary formations of Skaftafell, Síða and Fljótshevrfi, were analysed for high precision Sr-Nd-Pb-Hf-O isotopic ratios and REE elemental concentrations. The Eastern rift zone and Tertiary basalts both exhibit strong negative correlations between Sr-Nd isotopes. The Eastern rift zone lavas lie on a shallower trajectory to the main Icelandic array and trend towards the Öræfajökull lavas. Similar relationships are seen on $\Delta^{207}Pb$ and $\Delta^{208}Pb$ vs. $^{206}Pb/^{204}Pb$ and $^{87}Sr/^{86}Sr$ and $^{143}Nd/^{144}Nd$ vs. $^{206}Pb/^{204}Pb$ indicating a possible mixing relationship between the Eastern rift zone and Öræfajökull. The Tertiary lavas lie on a steeper trend and extend to considerably more enriched $^{143}Nd/^{144}Nd$ and $^{87}Sr/^{86}Sr$. An enriched end-member is required with considerably higher $^{87}Sr/^{86}Sr$ than other Icelandic lavas, excepting Öræfajökull which lies to the right of the trend. The enriched end-member does however have elevated $\Delta^{208}Pb$ and $\Delta^{207}Pb$ similar to Öræfajökull. It is possible that the different Sr-Nd trends for the Eastern rift zone and the tertiary lavas reflect a temporal change in the composition of the Öræfajökull source. Calculations, assuming a maximum age of 5Ma for the tertiary lavas [3], show that a $^{87}Rb/^{86}Sr$ of ~ 2.535, considerably higher than those seen within the Oraefajokull basalts ~0.04-0.14, is required to form the present day Öræfajökull $^{87}Sr/^{86}Sr$ from the most enriched tertiary lava. This indicates that the change in the Öræfajökull source cannot be explained through isotopic growth over time. Hence, the tertiary lavas allow the composition of the tertiary Öræfajökull source to be assessed and its mode of formation and evolution to be investigated.

[1] Prestvik et al. (2001), *Earth and Planetary Science Letters* **190** 211-220. [2] Kokfelt et al. (2006), *Journal of Petrology* **47** 1705-1749. [3] Helgason and Duncan (2001), *Geology* **29** 179-182.