

## Geochemical evidence for arc/back-arc association in the Bababudan greenstone belt, India

C. MANIKYAMBA\*, TARUN C. KHANNA,  
PRACHITI P. KANAKDANDE, K. RAJU, V. BALARAM  
AND A. KESHAV KRISHNA

Geochemistry Division, National Geophysical Research  
Institute (CSIR), Hyderabad-606, India  
(\*correspondence: cmaningri@yahoo.com)

New high precision major and ICP-MS trace element data on the volcanic rocks of Bababudan greenstone belt (BGB) in the western sector of the Dharwar craton, India indicated the occurrence of mafic-ultramafic rock suits generated in a convergent margin tectonic setting. The ultramafic rock compositions are quite distinct from komatiites and picrites, and constitute typically low  $\text{TiO}_2$  (~0.24 wt%), Zr (~10 ppm), Ti/V (~8), Ti/Sc (~45), high MgO (~24 wt%),  $\text{Al}_2\text{O}_3/\text{TiO}_2$  (~45), Cr (~1500 ppm), Ni (~600 ppm) at moderate  $\text{SiO}_2$  (~47 wt%) contents. They exhibit chondrite normalized concave upward REE patterns with depletion in MREE and reversely fractionated HREE (Gd/Yb~ 0.68) as observed for certain boninites from Neoproterozoic and Phanerozoic intraoceanic arcs. The mafic rocks comprise of Nb-enriched basaltic andesite (NEBA) and Mg-andesites (MA). Although NEBA and MA exhibit compositional similarities with respect to Nb (5-10 ppm), the former exhibits high  $(\text{Nb/La})_{\text{pm}}$  and  $(\text{Nb/Th})_{\text{pm}}$  relative to the latter. Furthermore, NEBA display distinguishable concentrations of major and trace elements with relatively low  $\text{SiO}_2$ ,  $\text{FeO}^*/\text{MgO}$ , Th, Sr, La/Sm, Gd/Yb but high MgO, CaO, Mg#, Cr and Ni contents than the MA. Nevertheless, both the groups display fractionated chondrite normalized REE with mild negative Eu anomalies ( $\text{Eu}/\text{Eu}^*\sim 0.9$ ) and primitive mantle normalized trace element patterns with depletions in Nb, Ta, Zr, Hf and Ti. NEBA and MA collectively display high Ti, Zr, V, Y, Ti/V and Ti/Sc compared to normal arc basalts and span the fields of back-arc basalts [1]. Boninites are considered to be derived by melting of a prior depleted, subsequently metasomatised, refractory peridotitic mantle wedge. While, Mg-andesites result from the variable degrees of partial melting of adakitic liquid metasomatised mantle source, and NEBA represent residual melts from hybridization, featuring shallow subduction of young and hot oceanic lithosphere. Though adakitic rocks have not yet been reported from this belt, but the high V/Ti (~0.13) and low Ti/Zr (~130) in the boninitic rocks and the low V/Ti (~0.03) and Ti/Zr (~43) in the associated mafic rocks (MA, NEBA) are consistent with their generation in a paired arc – back-arc tectonic setting.

[1] Woodhead *et al.* (1993) *Earth & Planetary Science Letters* **114**, 491- 504.

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

VANESSA MANN AND PETER TREMAINE\*

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

Partial molar volumes  $V^\circ$  and heat capacities  $C_p^\circ$  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  $V^\circ$  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 were characterized from  $^{13}\text{C}$  and  $^{31}\text{P}$  NMR spectra.

[1] Woolley (1997) *J. Chem. Thermodyn.* **29**, 1377–1385.  
[2] C. Xiao, Bianchi & Tremaine (1997) *J. Chem. Thermodynamics* **29**, 261–286. [3] Ehlerova, Trevani, Sedlbauer & Tremaine (2008) *J. Solution Chem.* **37**, 854–857.