

Storage and mobility of organic Nitrogen in the deep continental crust: Evidence from partially melted metasedimentary rocks

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In this study, we assess the ability of N isotopes to trace pathways of organic components into and within the solid Earth, focusing on the extent to which N (largely as NH₄⁺ bound in silicates) is retained through partial melting reactions experienced in the deep continental crust. The Mount Stafford region, central Australia, provides well-exposed metasedimentary rocks of greenschist to granulite grades (metamorphosed at 1.8 Ga), with higher-grade metashales showing evidence of partial melting at 2-4 kbars, 650-850°C. These rocks, divided into zones based on grade and extents of partial melting [1], were analyzed for N contents and δ¹⁵N by carrier-gas mass spectrometry methods.

δ¹⁵N_{air} increases from +2.5 to +4.5‰ for greenschist-facies rocks (Zone 1) to +2 to +9‰ for granulite-facies rocks (for sixteen Zone 4 samples, all but two have values ≥ +4.0‰), and N contents show subtle decrease with increasing grade (80-160 ppm in Zone 1; 15-165 ppm at the higher grades in Zones 2-4). Retention of N as a function of grade, perhaps as NH₄⁺ in micas (and K-fsp) and as N₂ in channels of cordierite, may indicate that N is held in peritectic products of partial melting, rather than in the melt. Analysis of the whole-rock major and trace element geochemistry of these samples demonstrates that N behavior, across grade and multiple water-saturated and dehydration melting reactions, is more similar to the behavior of K, Rb, Li, and Ba and less similar to the behavior of B and Cs, the latter which show dramatic losses with increasing grade. Variation in N/K₂O within grade likely reflects the complex residency of N in these rocks partly in phases other than micas (K-fsp, cordierite). These data have implications for deep-Earth N cycling, bearing on (1) the size of the N reservoir in the deep continental crust, in particular, the N contents of rocks that experienced water-saturated and/or dehydration-driven partial melting, (2) use of N isotopes in tracing open- vs. closed-system behavior during melting, and (3) use of δ¹⁵N of upper-crustal intrusive rocks as a tracer of their deep crustal sources.

[1] Greenfield *et al.* (1998) *Jour. Meta. Geol.* **16**, 363-378.

Study on Sulfur isotopes in rain water in Nanchang, China

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We analyzed the pH values, sulfur ion concentrations and the sulfur isotopic composition of rain water and lake water from Nanchang City in this paper. The δ³⁴S values of coal used in Nanchang City were also measured. The results indicated that the sulfur isotopic composition of rain water varies between -3.5‰ and 5.5‰, and the sulfur isotopic composition possesses a seasonal variation trend, isotopically lighter in summer and heavier in winter and spring. The sulfur isotopic composition of lake water and Ganjiang River water varies between 4.3‰ and 10.3‰. In 2006, Nanchang City was polluted seriously by acid rain, and the acidity of rain water is high in winter and spring. The sources of sulfur in rain water include bio-organic sulfur, anthropogenic sulfur and sulfur from the sea. In summer, the sulfur in rain water comes mainly from bio-organic sulfur. In winter and spring, the sulfur in rain water dominantly originates from anthropogenic sulfur. The sulfur in rain water from the sea may be very small in percentage.

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