Disequilibrium melting recorded in isotopic and trace element compositions of a pulsed granitoid, Mt Kinabalu, Borneo

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Geochemical heterogeneity in silicic systems - and by implication heterogeneities in the continental crust - can be derived from the melting processes or variations in their deep source regions. Mixing and assimilation during the ascent and emplacement of silicic plutons are also invoked to explain observed heterogeneities. We present a range of geochemical data collected from the zoned granite and granodiorite pluton of Mt Kinabalu in NW Borneo to provide insight into the role of such processes in development of this body and the timescales over which they occur.

The Mt Kinabalu pluton is an isolated post-orogenic intrusion. It formed following the Miocene orogenic inversion event recorded in NW Borneo that emplaced attenuated S. China crust, similar to the attenuated Mesozoic tonalitic crust of the South China Sea, beneath the region's ophiolitic basement. Post-orogenic extension and rapid related uplift (aided by the fast erosion rates of the region) led to dehydration partial melting of the tonalitic crust.

Melting resulted in the emplacement of five petrographically distinct major units at ~ 0.2Ma intervals, the first four between 7.85 and 7.22Ma (U-Pb in zircon, [1]. The oldest unit possesses significantly more radiogenic Sr and Pb and less radiogenic Nd isotope ratios than later units. This could be interpreted as evidence for isolated derivation or mixing of multiple sources, or contamination of one source. However, there is no accompanying variation in $\delta^{18}O$ or trace element ratios. More substantial trace element variation is displayed between the later units that display little isotopic contrast with one another. Instead, we interpret the isotopic data and trace element variations as the result of progressive disequilibrium melting under increasingly warmer conditions of the same region of relatively homogeneous crustal source rocks.

[1] Cottam, Hall, Sperber & Armstrong (2010), *Journal of the Geological Society* **167**, 49-60.

Transport of carbon colloid supported nano zero-valent iron

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Nano zero-valent iron (nZVI) is an emerging technology for *in situ* groundwater remediation. Due to its high reactivity, nZVI is able to dechlorinate organic contaminants and render them harmless. Carbo-Iron is a newly developed composite material consistiong of activated carbon colloids ($d_{50} = 0.6\text{-}2.4\ \mu m$) that are doted with nZVI particles. These particles combine the sorption capacity and mobility of activated carbon colloids and the reactivity of nZVI. Results from column tests and a two dimensional laboratory aquifer test system are presented: Column tests using columns of 40 cm length were filled with porous media. A particle suspension was pumped through the system. Results show, addition of a polyanionic stabilizer such as Carboxymethylcellulouse (CMC) is required to enhance mobility. Ionic strength and pH concentrations in an environmental relevant range do not interfere significantly with transport, but particle size was found to be crucial. Another experiment was performed in a two dimensional aquifer test system. The test system contains a sand filled container with an inner size of 40 x 5 x 110 cm and seven ports on each side. A constant flow of water was applied from the left to the right side through all ports and the middle port was fed with a Carbo-Iron suspension. Results show transport through the laboratory aquifer within few exchanged pore volumes, and breakthrough of ~60% of the injected concentration of Carbo-Iron at the outlet. Deposits of immobile Carbo-Iron were found to be decreasing with distance from the injection port. No gravity effects were observed. Results suggest high mobility of carbon supported nZVI under environmental relevant conditions. Carbo-Iron might be helpful to deliver nZVI into contaminated aquifers. Here 1D and 2D results support the design of a field test and application of Carbo-Iron for nZVI delivery.

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