Origin of highly differentiated granites from South China: Implications for W-Sn deposits

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Voluminous composite granite plutons occur in South China, accompanied by large-scale W-Sn deposits. Each composite pluton is composed of major phase granites and highly evolved late-stage granites. Traditionally, the late-stage granites are thought to be residual melts from the former via fractionation, and ore-forming materials and fluids are from granite magma itself. We propose a different model for the origin of highly evolved granites and related W-Sn mineralization, based on studies on the Qianlishan composite plutons that are composed of major phase coarse-grained biotite granites (163 Ma) and late-stage fine-grained granites (153 Ma). The major phase granites show features of normal granites, with LREE enrichment and medium negative Eu anomalies in the chondrite-normalized REE patterns. The late-stage granites are highly evolved, with non-CHARAC trace element features (very high K/Ba, and low K/Rb and Zr/Hf), and show HREE enrichment, huge negative Eu anomalies and typical "tetrad effect" in the REE patterns. We suggest that the late-stage granites were unlikely derivatives from the major phase granites via fractionation, but rather, derived from melting of the Proterozoic lower crust in a new tectono-thermal event, triggered by underplating of basaltic magma. Small amounts of basalts were involved in the source, as suggested by the higher $\varepsilon_{Nd}(t)$ values of the late-stage granites (-5.6 to -7) than the major phase granites ($\varepsilon_{Nd}(t)$ = -8). The late-stage granites show common occurrence of ilmenite, euhedral quartz enclosed in feldspar, and interstitial fluorite, suggesting a low fO_2, water-deficient and fluorine-rich feature for them. Addition of fluorine would significantly lower the solidus temperature and viscosity of magma, and thus prolong the process of magma evolution and facilitate fractional crystallization. Prolonged magma process would (1) enhance the interaction between granitic melt and meteoric water from country rocks, causing the formation of "tetrad effect" of REE patterns and non-CHARAC trace element features of the late-stage granites, and (2) heat and drive the circulation of meteoric water that subsequently, together with fluorine, extract ore-forming materials from country rocks through complexation, forming skarn-type W-Sn deposits in Ca-rich country rocks. So, the W-Sn deposits were genetically linked with the highly evolved granites.

Synthesis, toxicity and reactivity of several types of NZVI

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An emerging technology for the treatment of contaminated land and water is the use of nano-scale zero-valent iron (here after NZVI), which can rapidly dechlorinate chlorinated organics or immobilize heavy metals in contaminated groundwater [1-5]. The field demonstrations of applying nano-Fe0 technology for source remediation are promising.

Here, we report synthetic methods, surface property modification, mobility, toxicity and reactivity of several types of NZVI. These materials include commercial NZVI, fresh-made NZVI, NZVI supported on clay minerals, NZVI coated by CMC. It showed different bactericidal activity of these NZVI to Escherichia coli. The reactivity of these materials was also compared for Cr(VI) reduction and TCE degradation. Besides batch experiments and column test, in-situ remediation in a big sand-box was performed for iron and NZVI.

We paid more attention to the effects of pH, natural organic matter and ageing time on the reaction systems. During the process of water-pollutant-NZVI interaction, the different performance of several types of NZVI inferred that particle surface property is very crucial to NZVI application. Cost-efficient and long-term useful NZVI should be addressed more in the future.

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[1] Zhang, WX. (2003) Journal of Nanoparticle Research **5** (3-4): 323-332. [2] Lowry GV. (2005) Environmental Science & Technology **39** (5): 1338-1345. [3] Kanel, SR. (2006) Environmental Science & Technology **40** (6): 2045-2050. [4] Zhao DY. (2007) Water Research **41** (10): 2101-2108. [5] Chen JW. (2011) Water Research **45** (5): 1995-2001

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