

Ore-forming age and origin of the Donggou porphyry Mo deposit in the Eastern Qinling orogenic belt, central China

LI YANG¹, F. CHEN² AND X.-Y. ZHU¹

¹Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 100029, China

²School of Earth and Space Sciences, University of Science and Technology of China, Hefei 230026, China

The Qinling orogenic belt geologically consists of four tectonically juxtaposed zones, from south to north, the northern margin of the Yangtze Craton, South Qinling terrain, North Qinling terrain, and the southern margin of the North China Craton. The gigantic Mo-bearing metallogenic belt of East Qinling is mainly situated in the southern margin of the North China Craton and extends east-western from the Jinduicheng Mo deposit in west to the Tangjiaping Mo deposit in east. Previous studies have shown that the Mo mineralization in East Qinling occurred in three periods: 233-221 Ma, 148-138 Ma and 131-112 Ma, origin of the molybdenum ore-forming and related geodynamic setting but are still debated.

In this study, we report U-Pb zircon and Re-Os molybdenite ages and Sr-Nd-Pb isotopic compositions of the Donggou porphyry molybdenum deposit, being one of the superlarge deposits in this molybdenum mineralization belt. It is spatially associated with the fine-grained Donggou granitic porphyry, and hosted in the Mesoproterozoic rhyolite, andesite, and tuffaceous siltstone of the Xiong'er Group. Re-Os molybdenite dating results constrain two stages of the Mo mineralization in an interval of 3 Ma. Zircon U-Pb ages demonstrate the earlier Mo mineralization was almost simultaneous with the formation of the host Donggou granitic porphyry. Geochemically, this porphyry belongs to A-type granite, being enriched in contents of LILEs (such as K, Rb, Th and U) and HFSEs (such as Nb, Ta and Zr), strongly depleted in contents of Ba, Sr, Eu and Ti, and high Ga/Al ratios. Whole-rock Sr-Nd-Pb isotopic compositions of the porphyry implies that the Mo-bearing magma were derived from crustal material by partial melting in an intra-continental extensional environment.

Modeling of co-metabolic Cr(VI) reduction under denitrifying conditions

L. YANG, S. MOLINS, C.I. STEEFEL,
AND H.R. BELLER

Lawrence Berkeley National Laboratory, Berkeley CA 97020
USA, (LYang@lbl.gov, SMolins@lbl.gov,
CISteeffel@lbl.gov, HRBeller@lbl.gov)

Bioremediation of chromium contamination in groundwater often relies on *in situ* reductive immobilization strategies mediated by indigenous microbial communities stimulated with the injection of an organic electron donor. Depending on the presence of electron acceptors, a series of biogeochemical reactions and parallel abiotic geochemical reactions can occur, resulting in a complex network of enzymatic and indirect reaction pathways.

We used a reactive transport model [1] to interpret the rate of chromate reduction in a flow-through column experiment using natural Hanford 100H aquifer sediment into which a solution containing chromate, nitrate, and lactate was injected. The model includes biomass growth and decay, and thermodynamic limitations on reaction rates [2]. Further, we implemented a formulation that accounts for co-metabolic reduction of Cr(VI) based on previous studies on a pseudomonad isolated from the Hanford 100H aquifer [3]. Analysis of the experimental results indicate that the chromate reduction rates increased with the increasing denitrification rates, which is consistent with a co-metabolic mechanism. The reactive transport modeling agrees with this observation and was used to quantify the efficiency of the process. Model results also illuminate a change in reaction pathways as the nutrient ammonium was depleted, with the apparent result that another nitrogen source (i.e., nitrate) was used instead. Further, a kinetic conversion of nitrite to N₂ was needed to reproduce the observed pH behavior.

[1] Li, Steefel, Williams, Wilkins & Hubbard (2009) *Environ. Sci. Technol.* **43**, 5429-5435. [2] Jin & Bethke (2003) *Appl. Environ. Microbiol.* **69**, 2340-2348. [3] Han, Geller, Yang, Brodie, Chakraborty, Larsen & Beller (2010) *Environ. Sci. Technol.* **44**, 7491-7497.