Contrasting mineralization processes of the Jiaodong and Xiaoqinling gold concentrating districts in the eastern and southern margins of the North China Craton

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The Jiaodong and Xiaoqinling are the two of the most largest gold concentrating districts in the magrins of the North China Craton. In the Jiaodong gold district, the Linglong and Guojialing granitoids are the two major Mesozoic plutons, and most gold mineralization occurs within or near the granites. Our study suggests that the Linglong granites were derived via partial melting of Neoarchaean metamorphic lower-crustal rocks at depth of >50 km with an eclogite residue whereas the Guojialing granites were formed by the reaction of the delaminated eclogitic crust-derived melt with the upwelling asthenospheric mantle. We suggest that the Jiaodong gold mineralization was controlled by the Mesozoic extensional tectonics and may have a close relationship with lithosphere thinning in eastern China, and the ore formation was via mantle-crust interaction processes.

In the Xiaoqinling gold district, Au mineralization occurs mainly in the Archean amphibolite-facies basement rocks. Two Mesozoic granitoids of Wenyu and Liangliangshan are located in the ore district, but no gold mineralization has been found associated with the granites, although some small scale quartz-molybdenite veins occur within and around the granite bodies. The spatial association with large-scale compressional structures and deformation of lode gold veins, the CO_2-rich fluids as deduced from fluid inclusion study of quartz in the gold veins, the isotopic data of $\delta^{18}O$, δD, $\delta^{13}C$, $\delta^{34}S$, and $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$, and $^{208}Pb/^{204}Pb$, and Re-Os dating of molybdenite from the gold veins all point to an orogenic gold deposit for the major mineralization event in the Xiaoqinling district that may have a close relation with the Indosinian collision between the North China Craton and the Yangtze Craton, which is in sharp contrast to the mineralization processes of the Jiaodong gold districts.

Behaviour of ethanol blended petroleum hydrocarbons in a bench-scale aquifer tank

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Ethanol blended gasoline is extensively used in China. Releases of underground storage tanks can lead to groundwater contaminated by aromatic hydrocarbons such as benzene, toluene, ethylbenzene and xylene isomers (often refferred to as BTEX) along with ethanol, raising a new challenge for site remediation. To better understand the fate and transport of BTEX along with ethanol in contaminated groundwater, an injection experiment was conducted via a large bench-scale aquifer tank (5.52 × 3.04 × 1.30 m), in which a 0.90 m thick pristine silt sand layer was homogeneously created to simulate a porous aquifer, and then covered with a 0.30 m thick clay layer. A 2 L source mixture containing bromide (279 mg/L), ethanol (1468 mg/L) and BTEX hydrocarbons (5.3 mg/L total) was injected instantaneously into the porous aquifer. Under a forced hydraulic gradient of 0.0103, the injected compounds moved forward in a stable one-dimensional flow regime. Based on the distribution of bromide used as a conservative tracer, results suggest that both hydrodynamic dispersion and indigenous biodegradation are controlling processes in the fate and transport of ethanol and BTEX. Sorption of ethanol can be negligible with the retardation coefficient (R) of one. The ethanol plume, however, shrank continuously, which biodegradation occurred was fitted at the first-order biodegradation rate constant of 0.13 d^{-1}. BTEX compounds were retarded with estimated R values of 1.18 for both benzene and toluene and 1.28 for both ethylbenzene and the xylene isomers. Due to most dissolved oxygen (DO) and nitrate consumed by the preferential biodegradation of ethanol, benzene plume was extended with the longest length and the onsets of toluene was delayed. The correlation between the sequences of first-order biodegradation rate constant (k) $k_{\mathrm{Ethanol}} > k_{\mathrm{T}} > k_{\mathrm{E}} > k_{\mathrm{m/p\text{-}X}} > k_{\mathrm{o\text{-}X}} \approx k_{\mathrm{B}}$ and plume length (L) $L_{\mathrm{Ethanol}} < L_{\mathrm{T}} < L_{\mathrm{E}} < L_{\mathrm{m/p\text{-}X}} < L_{\mathrm{o\text{-}X}} < L_{\mathrm{B}}$ demonstrates that the mass removal of benzene for *in situ* bioremediation likely faces more difficulties. This study considering hydrodynamic dispersion can offer more insight into the assessment of natural attenuation and *in situ* bioremediation at ethanol blended gasoline spill sites.