Concentration and dissolution of some ore elements in oil-field water from the Jiyang depression, China

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Concentrations of Au, Ag and some base metal elements in oil-field water samples from the Jiyang depression, Shandong province are determined. Relative high gold concentration (up to 0.6 ppb), which corresponds to the higher gold concentration in crude oil (up to 220 ppb) is found. Certain correlation between Au and As, Hg and Pb is also revealed. The partitioning relationship of gold in rock, oil and water is unknown. This study, however, shows that the oil-field water might bring out some gold from oil in water-oil separation process.

Experimental study shows that the oil field brine was capable to promote the leaching, dissolution, and migration of these metals from the basement rocks into the solution, and acted as ore-forming fluid. Two types brine was recognized. $CaCl_2$ type brine favors to dissolve Pb and Zn, whereas $NaHCO_3$-type water is more effective for dissolving and transporting Au and Ag. Au and Ag can be transported in low temperature solution as thio complexes, while Pb and Zn tend to be transported by complexes with ions of CH_3COO^- and HS^-.

It is further postulated that the source of higher concentration of gold in both crude oil and oil field brine was from the gold-rich basement in the Jiyang area, where great amount of gold deposits occur in the vicinity regions.

Nitrogen isotope profile from the Cambrian SPICE Event: Comparison with Mo and other redox proxies

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Nitrogen is primarily controlled by the oxidation state of the environment via a series of biological reactions. As a result, changes in the environmental redox state will be reflected in the sedimentary $\delta^{15}N$ profile, which serves as a proxy for the nitrogen cycle over a wide range of time scales. A theoretical model illustrating the relationship between sedimentary $\delta^{15}N$ values and deep-water O_2 concentration can be used to elucidate the relative contributions from N-fixation, nitrification, and denitrification reactions under various redox conditions [1]. Local and global O_2 concentrations can also be evaluated using molybdenum concentrations and $\delta^{98/95}Mo$ measurements [2]. In addition to their value as independent redox proxies, N and Mo are interconnected because Mo-nitrogenase is the most common form of nitrogenase in N-fixing organisms.

To explore the relationships between Mo, N, and O_2, we measured total N and $\delta^{15}N_{bulk}$ values of Cambrian Alum Shale samples (Andrarum-3 borehole, Sweden), and compared them to other redox proxies, including $\delta^{13}C$, TOC, $\delta^{98/95}Mo$, total Mo, and iron speciation [3, 4]. A decrease in the $\delta^{15}N_{bulk}$ coincident with the global SPICE peak in $\delta^{13}C$ and $\delta^{34}S$ and a sharp negative $\delta^{98/95}Mo$ excursion, suggests an increase in N fixation and supports previous conclusions that conditions at this location were anoxic/euxinic. The relationship between Mo concentration and $\delta^{15}N_{bulk}$ appears to be complex. The signal for N-fixation intensifies despite decreases in the concentration of sedimentary Mo and sharp decrease in $\delta^{98/95}Mo$; however, after the SPICE event the succession records the highest Mo concentrations and most intense signal for N-fixation, suggesting reorganization of the N cycle may coincide with an increased marine Mo inventory.

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