Uranium transport and deposition in iron oxide copper gold deposits (IOCG's): An experimental approach

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Iron oxides Copper gold type deposits in southern Australia often contain quantities of uranium, both at economic and the subeconomic level. Olympic Dam (OD) is the largest U resources in the World, but uranium also at Prominent and Moonta where the uranium is subeconomic and a problem in ore concentrates. In South Australian IOCG deposits the ores are unusually oxidised, consisting of hematite, with bornite, chalcopyrite and pyrite as the main sulphide minerals. The uranium occurs in a variety of 'primary' minerals including uraninite and brannerite and these minerals exhibit a remarkably diverse range of textures suggesting extensive remoblization.

We initiated an experimental study of hydrothermal mineral reactions in the Fe-Cu-S-U system, focusing in particular on the fate of U during sulphidation reactions. Much of the U in these IOCG deposits is secondary (either remobilised, or added in hydrothermal events postdating Fe-Cu mineralization). Applying the principles of interface coupled dissolution-reprecipitation reactions, we were able to reproduce the IOCG mineral assemblages experimentally by reaction of a Cu-rich fluid with hematite. When U is added to the system as uranyl salt or UO_2(s), U precipitates during the sulphidation reaction. Synchrotron experiments were used to characterize the nature of the U in the ores as well as of U precipitated during sulphidation reactions, information critical for deciphering the mechanism of U scavenging. This information improves our understanding reactions at interfaces with conditions far-from-equilibrium in controlling metal endowment.

The characteristics of an old gas reservoir in Sinian strata, central Sichuan basin, south China

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The study region is an important exploration area which has great prospect in Sichuan basin. By analyzing the formation conditions, accumulation periods and characteristics of Sinian gas reservoir in this area, we found that the natural gas is mainly oil cracking gas and the main source rocks were black sapropelic shales at the bottom of Qiongzhusi formation in Lower Cambrian, followed by dark algae dolomite and shale in the third member of Dengying formation. The formation of effective reservoir was controlled by supergene karstification and sedimentary facies. The reservoir was widely distributed with large thickness but strong heterogeneity. The area located at the east high point of an ancient uplift in a long period, whose structual evolution was inherited. It developed large-scale low-amplitude anticline in this region, and the trap formed by top of Sinian System could be 1128km^2, whose closure was over 200 meters [1]. The trap had strong oil and gas capability.

Analysis of the structural evolution history of the region and thermal history of the source rocks showed that: the source rocks in the 3rd member of Dengying Formation started to generate a large sum of hydrocarbon from the Ordovician to Silurian, the liquid hydrocarbon generated accumulated in top of ancient uplift to form paleo-reservoir; the structural uplift at end of the Silurian terminated the first stage of hydrocarbon generation. They entered the second stage of hydrocarbon generation from the Late Permian. While source rocks in Qiongzhusi formation entered the main phase of hydrocarbon generation from the Triassic to the Middle Jurassic, the hydrocarbon accumulated in the weathered crust of Dengying formation at top of ancient uplift to form paleo-reservoir. They entered the main stage of gas generation from the Late Jurassic to the Early Cretaceous, the liquid hydrocarbon of paleo-reservoir cracked to gas, which accumulated as present gas reservoir [2]. The homogenization temperature of fluid inclusion in Sinian carbonate of this area also supported this view.

[1] Zhang Lin, *et al*..(2004),Natural Gas Geoscience15,584-589. [2]Yao Jianjun,et al.(2003),Petroleum Exploration and Development30,7-9.

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