The Carlin type gold deposits and its geochemistry of ore-forming fluid in Dian, Qian, Gui provinces

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Based on the comprehensive and systematic geology and geochemistry research, included field investigation and lab study, the following main conclusions have been arrived at:

Carlin type gold deposits have a close relationship with the Youjiang mantle uprising which is the essential forming and controlling factor of them. The different epochs of the Youjiang mantle are, the different assemblages of gold deposits may be classified, one is the Mantle Uprising type gold deposits (1) ;the other is the Mantle Subsidence type gold deposits (2).There are both similarity and distinction between above two type gold deposits in geological and geochemical characteristics.

The relationship of the Carlin type gold deposits with the magmatic activity is very closely. Type I is closely related to the Hercynian basalt (P3β) and diabase and the Yanshan alkali ultrabasic rocks—alkaline rocks, Type2 is intimately related to the Yanshannian (intermediate) acidic igneous rock which is covered and concealed.

The ore-forming fluid of the gold deposits is similar to and goes through long term changed, but there are still some slight disparities, too. It comes from ancient fluid, such as ancient atmospheric water, ancient formational solution (mineral water, ancient ocean-water, organic brine) and magmatic hydrothermal.

The metallogenic process is a synthesis which includes inorganic and organic.

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Surface-mediated nucleation and growth of Iron oxides

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Surface-mediated nucleation and growth of iron oxide nanoparticles and films on mineral surfaces can significantly influence the fate and transport of toxic metal contaminant and potentially alter the porosity and permeability of geo-media. Therefore, more accurate quantitative and qualitative information about the mechanisms and kinetics of nanoparticle development at surfaces is required. However, direct *in situ* observations of nanoscale surface particle development have been challenging because of lack of proper tools.

In this work, we have designed a time-resolved simultaneous small angle x-ray scattering (SAXS)/grazing incidence (GISAXS) setup for real-time monitoring of water-mineral interfacial reactions. The size, shape, and distribution of iron oxide nanoparticles on quartz surfaces as well as in solutions and their growth modes were monitored as a function of exposure time, ionic strength, and the presence of aqueous arsenate. Nanoparticles formed preferrentially along steps rather than terraces. In the absence of any other ions, the earliest nuclei sizes of iron oxides are 1.7 ± 0.5 nm (in-plane radius) and are evenly distributed at the mineral surfaces. As exposure time increases, the nuclei began to coalesce with each other and form larger surface clusters. More interestingly, the presence of arsenate ions significantly influenced nanoparticle size (i. e., smaller critical nucleation size) and altered the kinetics of the iron oxide nucleation and growth. For comparison, we conducted complementary measurements of samples with atomic force microscopy (AFM) for interfacial observation, as well as dynamic light scattering (DLS) and transmission electron microscopy for particles in solutions.

Using a new *in situ* time-resolved SAXS/GISAXS technique, this study provides more accurate depiction of evolving nanoparticle distributions and topology at an active interface without dehydration. Our findings have implications not only to hydrous iron oxide containing environmental systems such as acid mine drainage (AMD) but also to any type of precipitation processes at solid-water interfaces in materials science or environmental research.