Phases of gold and silver in the sediments in the Jidong gold ore concentration area, China

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49 samples of sedment in Jidong ore concentration area, located in the subunit of the yanshan fold belt in north China platform - the middle of Malanyu uplift, were sampled and the different phases of gold and silver were analized. The results showed that eight phases of gold(soluble facies, surface adsorbing facies, organic facies, carbonate facies, natural gold facies, iron and manganese oxides facies, sulfide facies and residual facies) could be detected in the sediments and seven phases of silver(as same as phases of gold except natural gold facies) could be detected in the sediments. Au of sediments existed mainly in the phases of natural gold facies and sulfide facies in the gold abnormal area, while in the background area, mainly in natural gold facies and organic facies. But to the silver of sediments, both existed mainly in the sulfide facies and residual facies in gold abnormal area and the background area. Thus could be utilized in the evaluation of anomaly and be propitious to gold deposit exploraton in the area.

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Pb and Zn Coprecipitation with Iron Oxyhydroxide Nano-Particles

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Pb and Zn coprecipitation with Fe^{3+} was studied with sorption edge measurements, desorption experiments, paired coprecipitation – adsorption experiments for comparison, sorbent aging, EXAFS, High Resolution Transmission and Analytical Electron Microscopy (HR TEM–AEM), and geochemical modeling. Coprecipitation of Pb with ferric oxyhydroxides occurred at ~ pH 4 [1] and for Zn at pH ~5 [2], about 0.5-1.0 pH unit higher than Fe^{3+} precipitation. Coprecipitation is more efficient than adsorption in removing Pb and Zn from aqueous solutions at similar sorbate/sorbent ratios and pH. HRTEM of the Pb-Fe and Zn-Fe coprecipitates shows a mixture of 2 to 6 nm diameter 2-line ferrihydrite spheres. The co-refinement of the Pb LIII-edge and the Fe Kedge EXAFS spectra suggested that Pb formed a solid solution in the Pb-Fe coprecipitate [3]. Desorption experiments show that more Pb^{2+} was released from loaded sorbents collected from adsorption experiments than from Pb to Fe coprecipitates at dilute EDTA concentrations. Desorbed Pb^{2+} versus dissolved Fe^{3+} data show a linear relationship for coprecipitation desorption experiments but a parabolic relationship for adsorption experiments.

Based on these results, we hypothesize that Pb^{2+} was first adsorbed onto the nanometer-sized, metastable, iron oxyhydroxide polymers of 2-line ferrihydrite with domain size of 2–3 nm. As these nano-particles assembled into larger particles, some Pb^{2+} was trapped in the iron oxyhydroxide structure and re-arranged to form solid solutions.

Our study shows that coprecipitation and adsorption experiments resulted in different Pb and Zn incorporation mechanisms, which could result in different mobility, bioavailability, and long-term stability of trace metals in the environment.

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