Superimposed processes of Gold and Silver mineralization in the Dayingezhuang gold deposit, Jiaodong gold province, China: Constraint of ore-forming fluid geochemistry

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The Dayingezhuang gold deposit is located in the central part of the Zhaoping Fault Zone, which is one of the most important gold-hosting faults in the Jiaodong gold province of China. Dayingezhuang is a typical large scale shear zone-hosted disseminated gold deposit with superimposed silver mineralization. Microthermometry of Fluid inclusion (FI) shows multiple values, indicating multi-stage hydrothermal fluid activities and mineralizing events. In general, ore-forming fluids are characterized by low salinity and low density. Homogenization pressures of FI are estimated from 20×10^5Pa to 220×10^5Pa. Redox conditions shifted from weak oxidation, through reduction, to weak reduction; and pH values varied from weakly acidic, through basic, to weakly acidic during ore-forming processes. Reduction and oxidation of silver mineralizing fluids are lower than those of the gold-bearing fluids. Gold mineralizing fluids are NaCl type and silver mineralizing fluids are rich in F. The change in ore-forming fluids from K_2SO_4 type to NaCl type indicates the superposition of two hydrothermal mineralizing events. Ore-forming fluids were dominated by magmatic components in early mineralization period, and affected by meteoric waters in late period. Gold may have been transported as Au-S or Au-Cl complexes, whereas silver was transported as Ag-Cl complexes. Early fluid boiling and later fluid mixing are thought to be two of the main factors causing the deposition and superimposing of gold and silver to from the large deposit.

Study of the rhizofiltration by using *Phaseolus vulgaris var.*, *Brassica juncea (L.) Czern.*, *Helianthus annuus L.* to remove Cesium from groundwater

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Rhizofiltration is one of the clean up processes by using plants(mainly their roots) to remove heavy metal from water.

Batch scale experiments were perfomed to investigate the cesium removal efficiencies of the rhizofiltration from the artificially contaminated groundwater having cesium concentration of 55.7 μg/L. Three terrestrial plants such as *Phaseolus vulgaris var.* (Bean), *Brassica juncea (L.) Czern.* (Indian mustard), and *Helianthus annuus L.* (Sunflower) were used for the experiment. The glass tank (12 cm×12 cm×8 cm) containing 400 ml of the artificially cesium contaminated groundwater was used as the growth chamber for the rhizofiltration. Groundwater in the growth tank was sampled at 12, 24, 48, and 72 hr and its cesium concentration was analyzed on ICP/MS (Perkin elmer, Elan6100(USA)). From the results of experiment, three plant cultivars reduced cesium concentrations from 55.7 to 0.3 μg/L in groundwater within 12 h of rhizofiltration. After 72 h, its cesium concentration maintained at 0.013 μg/L and the removal efficiency was 99.9 %. From the results of the analysis on the cesium accumulation for *Helianthus annuus L.* and *Phaseolus vulgaris var.*, 96 and 92 % of initial cesium were accumulated in the root and 4 and 8 % of cesium existed in the shoot part(including leaves), respectively. The amount of cesium transported to the shoot from the root for the rhizofiltration process was very small. To identify the effect of different cesium concentrations on the velocity and the magnitude of cesium removal from groundwater, three different plant cultivars were exposed to 400 ml of artificially contaminated groundwater with different initial cesium concentrations ranging from 150 to 500 μg/L for 72 h. For *Helianthus annuus L.* and *Phaseolus vulgaris var.*, more than 99 % of initial cesium concentration were removed from the solution (500 μg/L) and the cesium concentration of residual solution maintained lower than 1 μg/L. For *Brassica juncea (L.) Czern.* with 500 μg/L solution, the removal efficiency maintained about 60 % and was less effective, compared with those of *Helianthus annuus L.* and *Phaseolus vulgaris var.*