Paper No. 152-18 Presentation Time: 1:30 PM-5:30 PM

SULFIDATION, ADSORPTION, OR UNKNOWN ARSENIC LIGAND? UNRAVELING THE MYSTERIES OF CARLIN-TYPE DEPOSITS

GRAVES, Robert S.[1], AREHART, Greg B.[1], and FUERSTENAU, Maurice, C.[2], (1) Geological Sciences, University of Nevada, Reno, Geological Sciences MS-172, University of Nevada, Reno, Reno, NV 89557, gravesr@scs.unr.edu, (2) Chemical & Metallurgical Engineering, University of Nevada, Reno, Chemical & Metallurgical Engineering MS-(388/312), University of Nevada, Reno, Reno, NV 89557

Early investigators suggested an active role for carbon in the genesis of Carlin-type deposits based on the strong deposit-scale correlation between gold and carbon and also from the fact that the organic material in Carlin-type deposits can adsorb gold complexed with ligands used during the hydrometallurgical recovery of gold. More recent work has shown that there is no correlation between gold and carbon at the millimeter to micron scale. Whereas cyanide is the main ligand used in the hydrometallurgical extraction of gold from Carlin-type ore, the gold is thought to be transported as a bisulfide complex during the formation of the deposits. Therefore, experiments were conducted in order to determine whether or not gold bisulfide does indeed adsorb on activated carbonaceous material. Experiments were conducted using a 500mL Pyrex reaction kettle where gold in solution as a bisulfide complex ($Au(HS)_2^-$) was reacted with coconut husk activated carbon and preg-robbing organic material from a Carlin-type deposit. The experiments were conducted at 25, 50, and 75°C with sulfide concentrations between 0.1 and 0.2 molar.

Gold bisulfide was removed from solution at all temperatures examined by the mechanism of adsorption onto activated carbon. Changes in pH and sulfide concentration during the experimental runs were negligible. Assuming that gold bisulfide may be adsorbed on carbonaceous material at hydrothermal temperatures, these results suggest either 1) that organic matter was emplaced after gold deposition, or 2) that gold may be transported by an unknown arsenic complex that is not adsorbed to activated carbon, or 3) that organic material commonly found in Carlin-type deposits may have played a more active role in the formation of the deposits than previously believed. We propose that organic material acted as a temporary “holding complex” that increased the residence time of gold locally, thereby facilitating its incorporation in arsenian pyrite.

2002 Denver Annual Meeting (October 27-30, 2002)
Session No. 152--Booth# 18
Economic Geology (Posters)
Colorado Convention Center: Exhibit Hall
1:30 PM-5:30 PM, Tuesday, October 29, 2002