COPPER DEPOSITION BY CEMENTATION ONTO ROTATING ALUMINUM DISC FROM THE ACTUAL LEACH SOLUTIONS

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In the hydrometallurgical processing of minerals, various operations are performed for the purification of the solutions obtained from the dissolution of minerals. Cementation or metal displacement reactions are one of the most effective and economical techniques used in hydrometallurgical processes for purification of leach solutions and recovering toxic and/or precious metals from industrial waste streams. Cementation is an electrochemical process, where a metal ion presented in a solution is reduced to the metallic state with a more active metal placed in the solution. Metal ions deposit at cathodic sites while reductant metal dissolves at anodic sites, and electrons are conducted between the two phases. Copper cementation is performed for removing Cu²⁺ from electrowinning and electroplating solutions or recovering copper from leach solutions [1-3]. In this study, recovery of metallic copper from the leach solutions containing Cu²⁺ ions was investigated.

The leach liquors obtained from the leaching of malachite, an oxidized copper ore, in aqueous acetic acid solutions were used to recovery of metallic copper. These liquors containing Cu²⁺ ions were provided from our previous work [4]. Aluminum disc was used as reductant metal in the tests. The effects of copper ion concentration, rotating speed of Al disc, pH of solution and temperature on copper cementation were investigated. The amount of deposited copper was calculated according to difference between the initial and final copper concentration of the solution. It was determined that copper cementation increased with increasing initial copper concentration in the leach solution, rotating speed of disc and temperature, and decreasing solution pH. It was detected that the reaction followed first-order kinetics, and progressed according to the diffusion controlling step. Figure 1 shows the effect of rotating speed of Al disc on copper cementation. According to experimental findings, almost of all copper in the leach liquor obtained from the dissolution of malachite in aqueous acetic acid solution was deposited using rotating Al disc.

Figure 1. Effect of rotating speed of Al disc on copper cementation.

References