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The Fe removal through mineralogical phase transformation of pyrite by physicochemical method

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Gold is often associated with sulfide minerals (arsenopyrite, pyrite, chalcopyrite, pyrrhotite, galena) as “invisible” gold that is thought to consist either of submicrometer metallic particles or to be bound to sulfur in metal sulfide lattice. Pyrite is one of the major minerals accumulating gold in most ores, although a solubility of Au in nonarsenian pyrite is minor, and increased concentrations of gold are associated with arsenic content and iron deficiency.

The objective of this study was to investigate the Fe removal through mineralogical phase transformation of pyrite by physical treatment (high frequency) and chemical leaching (ammonia solvent). The high frequency treatment experiment for the pyrite showed that (1) the pyrite phase was transformed pyrrhotite and magnetite, (2) mass loss of the sample by volatilization of included sulfur(S) in pyrite. The treated pyrite by high frequency was observed rim structure from photomicrograph result. Fe removal experiments for were performed under various conditions of high frequency exposure (10∼60min), grain size (+140 mesh∼-325mesh), sulfuric acid concentration (0.5∼3.0M), ammonia sulfate concentration (1.7∼6.8M), hydrogen peroxide concentration (0.5∼3.0M). Increasing the high frequency exposure produced a positive effect on Fe removal in arsenopyrite. The highest percentage Fe removal of 95.53% was obtained under the following conditions by ammonia solvent: grain size = -325mesh, sulfuric acid concentration = 2.0M, ammonia sulfate concentration = 5.1M, hydrogen peroxide concentration = 1.0M.

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