

Copper Recovery from Chalcopyrite Concentrate by Oxidative Roasting and Acid Leaching

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In this study, a combined process consisting of salt roasting and acid leaching was conducted to recover copper per sulphide concentrate with 43.5% of chalcopyrite. The chalcopyrite concentrate was roasted in the absence and the presence of potassium chloride (mass ratio of concentrate:KCl from 1:0.5 to 1:0.9) at various temperatures (400–600°C) and different roasting times (1–4 hours) under air atmosphere. The roasted concentrate was dissolved in sulphuric acid solution (60 g/L) with a solid-liquid ratio of 1:8 at an ambient temperature for 2 hours. The chalcopyrite concentrate, roasted samples, and leached residues were analyzed using atomic absorption spectrometry, UV-VIS spectrophotometer, and X-ray diffractometer. Thermogravimetry and differential thermal analyses were applied on the chalcopyrite concentrate and the concentrate with KCl up to 1000°C. Results showed that about 80% and 90% of chalcopyrite decomposed under the conditions with the copper concentrate:KCl ratio of 1:0.6, roasting time of 2 hours at 500°C and 550°C, respectively. The DTA-TG analyses revealed variant phase regions associated with chalcopyrite decomposition through the roasting. Copper dissolution with the sulphuric acid solution from the roasted concentrates was over 99.7% and 99.0% under the determined conditions. The thermodynamic stability of chalcopyrite with KCl was discussed by calculating Gibb's free energy.

Keywords : Chalcopyrite, Oxidative roasting, Sulphur dioxide, Sulphuric acid leaching