

Optimization of Leaching Properties of a Low-Grade Copper Ore Using Central Composite Design (CCD)

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Abstract : Worldwide demand for copper has led to intensive search for methods of extraction and recovery of copper from different sources. The study investigates the leaching properties of a low-grade copper ore by optimizing the leaching variables using response surface methodology. The effects of key parameters, i.e., temperature, solid to liquid ratio, stirring speed and pH, on the leaching rate constant was investigated using a pH stat apparatus. A Central Composite Design (CCD) of experiments was used to develop a quadratic model which specifically correlates the leaching variables and the rate constant. The results indicated that the model is in good agreement with the experimental data with a correlation coefficient (R²) of 0.93. The temperature and solid to liquid ratio were found to have the most substantial influence on the leaching rate constant. The optimum operating conditions for copper leaching from the ore were identified as temperature at 65C, solid to liquid ratio at 1.625 and stirring speed of 325 rpm which yielded an average leaching efficiency of 93.16%.

Keywords : copper, leaching, CCD, rate constant

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