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Extraction of Zinc from Residues of Leaching By Acid Attack

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ABSTRACT

The study focuses on extraction of zinc from residues of leaching by chemical attack, using acid attack by the cell return solution and finding the optimum conditions for the extraction parameters: temperature, pH and duration of the leaching process. The acidity of the cell return solution (158 g/L) was determined by acid-base assay using colored indicators (methyl orange). The results obtained showed that the zinc concentration in the filtrate was found to be 97.84 g/L, at PH of 1.5 and a temperature of 75°C for 150 min.

Keywords: Zinc, leaching, acid, residues

1 Introduction

Zinc is an essential metal that plays a crucial role in various industries. It is primarily extracted from the Earth's crust, where it is commonly found in the mineral form of zinc sulfide, known as sphalerite or blende (ZnS). This mineral is typically processed to obtain pure zinc metal for commercial use. The extraction of zinc involves a series of processes, with hydrometallurgy or wet processes being the most commonly employed methods. However, during the extraction and purification processes, there can be losses of zinc, primarily due to its complex formation with iron in the solid residues. This complex is often difficult to recover, leading to reduced overall efficiency in zinc recovery. To address this issue and maximize zinc recovery, acid leaching treatment is employed. The success of the acid leaching treatment depends on various factors, including the reaction temperature, duration of the leaching process and pH of the reaction medium. Increasing the reaction time and temperature in an acidic environment enhances the dissolution of zinc, resulting in higher zinc content in the filtrate. This approach also helps minimize the losses of zinc in the solid residues, improving the overall efficiency of zinc extraction.

2 Experimental

The test consists of attacking a quantity of the residue with a cell return solution at different pH values in a 1000 ml beaker, and stirring with a stirrer on a hot plate. After the set reaction time, filtration is carried out to separate the solution from the sludge. The effectiveness of the experiments can be assessed by analyzing the sludge and the solutions obtained.

3 Results and Discussion

The results obtained showed that as the acidity of the medium increases (pH = 1.5), the zinc losses in the residues decrease. The results of Table I. showed that zinc dissolution can be improved if the reaction time and temperature are increased to 150 min and 75°C respectively. The concentration of zinc in the filtrate at optimum conditions exceeds 97.84 g/L.

Table1: Zinc content in wet zinc extraction at pH 1.5

Time (minutes)		90	120	150	90	120	150	90	120	150
Temperature (°C)		55	55	55	65	65	65	75	75	75
Zinc concentration in filtrate (g/l)		53,49	57,85	63,89	66,56	73,30	82,06	92,71	97,07	97,84
Zinc content in residues (%)	Zn (total)	17,50	17,10	18,43	17,00	16,80	18,12	16,10	15,89	17,53
	Zn(H ₂ SO ₄)	6,33	4,72	9,2	5,92	4,92	7,49	5,83	4,33	6,81
	Zn(H ₂ O)	2,52	2,39	6,11	2,30	2,02	5,90	1,94	1,84	5,01



4 Conclusions

The conducted study on the zinc extraction from residues of leaching by chemical attack showed that the zinc concentration in the filtrate exceeds 97.84 g/L, at PH of 1.5 and temperature of 75 °C for 150 minutes. The results obtained indicate the possibility of extract zinc from residues of leaching by acid attack

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