Extraction of Molybdenum by ION Exchange Resins of Various Grades from Technological Solutions WPRM of CSP JSC «Almalyk Mmc»

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ABSTRACT: This article analyzes new sorbents for the sorption process in the extraction of rare metals by the hydrometallurgical method. The factors affecting the sorption process to increase the efficiency of the process are investigated and schemes of a modernized sorption column are developed. And also, established and justified, effective modes of sorption leaching.

KEYWORDS: molybdenum, gas purification, ion exchange sorption, roasting, polyanines, Lewatit MP-62, Purolite, Lanxess, solutions.

I.INTRODUCTION

To date, the most widely used ion-exchange extraction of molybdenum from poor mother and waste solutions and wash water. The remaining possibilities of using ion exchangers in molybdenum technology are very promising. Ion exchange recovery from solutions after acid treatment of poor oxidized ores and concentrates is an urgent task, since these ores and processing methods are of great industrial importance.

Molybdenum is sorbed by both cation exchangers and anion exchangers. Of great practical importance is the sorption of molybdenum on anion exchangers. The MoO_2^{2+} ion exists only in strongly acidic solutions in which many other metal ions can be sorbed simultaneously and where the concentration of the competing H^+ ion is high. Under these conditions, ion exchange treatment of molybdenum solutions from impurities of heavy non-ferrous, alkaline and other metals can be carried out. In a strongly alkaline medium (pH = 8), molybdenum is in the form of the unpolymerized anion MoO_4^{2-}. The total exchange capacity of anion exchangers for molybdenum in a strongly alkaline medium is lower than at a lower pH, at which the molybdenum in solution is in the form of polymerized, large volume ions of para-, meta- and other polymolybdates. But the large volume of these ions introduces spatial difficulties into the sorption process: it is required that the active groups of the ion exchanger be possibly less screened by other elements of its structure

II. METHODOLOGY

Traditional technological schemes for the extraction of molybdenum from molybdenum raw materials include stages of oxidative firing and hydrometallurgical processing of firing products. During oxidative roasting, molybdenite, rhenium, and other associated elements are sublimated and trapped in a wet dust-gas collection system [1]. Not only sublimates, but also molybdenum, as a result of dust removal, pass into the solution circulating in the gas capture system. The molybdenum content in them varies in the following ranges: from 2-3 g / 1 to 8-10 g / 1. The amount of molybdenum in sulphate solutions of gas purification depends on compliance with the oxidative firing regimes and on the quality of the feedstock. In order to reduce the articles of metal loss in metallurgical processes, molybdenum in gas cleaning solutions of furnaces must be removed. As the most acceptable method for the concentration and extraction of molybdenum is considered ion-exchange sorption.

Today, there are various types and brands of sorbents designed for sorption extraction of valuable components. With the development of science and technology, the spectrum of these sorbents is expanding.

Studies were conducted to determine the sorbent that has the best performance for the sorption of molybdenum from solutions. The sorbents of the British company Purolite, as well as the sorbents of the company Lanxess, were tested. The main feature of WPRM technological solutions is that they contain molybdenum in the composition of polymerized polyanines. The presence of a cationic form for the presence of molybdenum was also revealed [2]. To determine the best sorbent for molybdenum, sorbents of the A111, A100MO brands manufactured by Purolite, as well as Lewatit MP-62 from Lanxess, were tested. As a result of research, the following results were obtained:

Table 1.

Results of sorption of molybdenum from sulfuric acid solutions of gas recovery systems of WPRM furnaces under static conditions (sorption duration is 5 hours)

№	Indicator name	A111 Purolite	A100MO Purolite	LewatitMP-62Lanxess
1	COE, %	3,20	4,65	2,98
2	Extraction of molybdenum in the sorbent phase,%	17,8	18,3	16,5

The complexity of the ion-exchange extraction of molybdenum from sulfate solutions is due to the competing action of sulfate ions SO_4^{2-}. Based on this, to increase the efficiency of sorption of molybdenum from strongly acidic solutions, operations are required to reduce the acidity of technological solutions [3].

Decreasing the acidity of the sulfuric acid solution by neutralizing with soda ash or caustic soda, as well as with ammonia, is impractical, since when using soda, solutions with a high content of sodium ions are obtained, the presence of which adversely affects the quality of the finished product. When using ammonia, the consumption of a 25% aqueous solution of ammonia is very large.

An experiment was also carried out using a dilute acid solution with water in a ratio of 1:1, in order to reduce acidity. The above sorbents were used; the sorption conditions were also similar to the previous experimental conditions.

Table 2.

The results of sorption of molybdenum from water diluted sulfuric acid solutions of gas treatment systems of kilns in static conditions (sorption duration - 5 hours)

№	Indicator name	A111 Purolite	A100MOPurolite	LewatitMP-62 Lanxess
1	COE, %	3,20	6,82	3,58
2	Extraction of molybdenum in the sorbent phase,%	40	53,6	48

From the data of table 1 it is seen that the best indicators of sorption of molybdenum from sulfuric acid solutions of gas purification systems is the sorbent brand A100MO Purolite. After practicing the molybdenum desorption process, a regenerating reagent, 7% aqueous ammonia solution, was chosen for this sorbent.
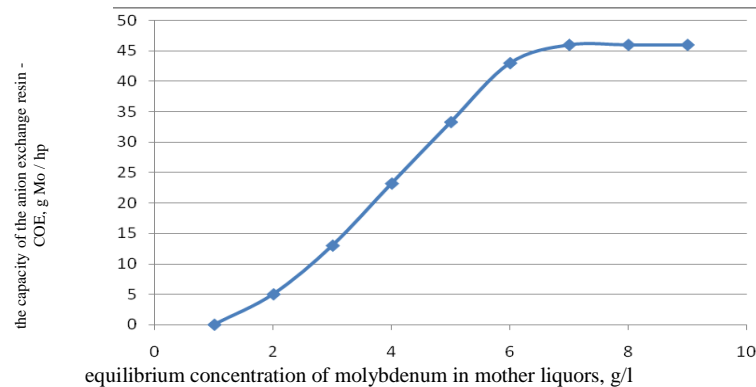
Fig. 1.Molybdenum sorption isotherm from sulphate mother solutions of rhenium sorption on anionite A100MO.
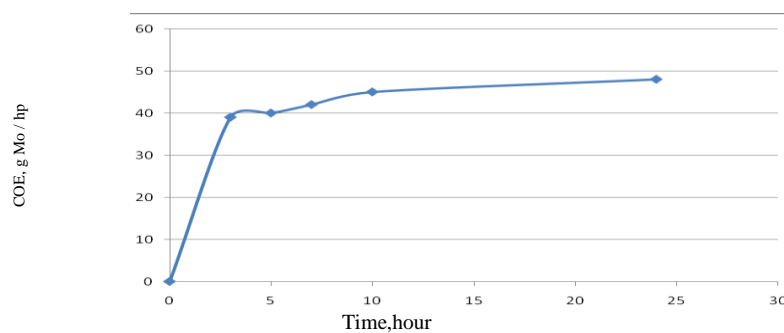

Fig. 2. Kinetic curve of sorption of molybdenum from a sulfate solution on resin A100MO.

The table shows that the best indicators of sorption of molybdenum from sulfuric acid solutions of gas purification systems is the sorbent A100MO Purolite. For this sorbent, a regenerating reagent, 7% aqueous solution of ammonia, was chosen.

III. CONCLUSION

The complex composition of the sulfate solutions of the gas treatment systems of the furnaces and the form in which molybdenum is present in them complicate the process of sorption extraction of molybdenum from these solutions. The low content of molybdenum (about 3-8 g / l) makes the use of other methods of concentration and extraction unacceptable. Based on the foregoing, the search and synthesis of sorbents, in particular anion exchangers, for sorption of molybdenum from WPRM sulfate solutions is an urgent task for AMMC, for the solution of which various research works based on WPRM are carried out, with the involvement of other scientific institutes of Uzbekistan.

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