SORPTION METHOD OF PROCESSING MOLYBDENUM-CONTAINING

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All over the world, there is an increased interest in research that allows you to create energy-saving and environmentally sound technologies for the disposal and processing of industrial waste, since natural resources are depleted, and the level of man-made pollution has long exceeded all permissible standards. Man-made wastes, being complex composite formations in composition, contain non-ferrous and rare metals in concentrations of industrial interest, and in some cases exceeding their content in ores. Of the various man-made wastes, the wastes of the metallurgy enterprises of non-ferrous and rare metals are of particular interest [1–3].

Molybdenum concentrates serve as raw materials for the production of ferromolybdenum and chemical compounds of various degrees of purity: molybdenum trioxide, ammonium molybdate, sodium molybdate, calcium molybdate, metallic molybdenum is produced from pure MoO_3 [4, 5].

Recently, for the selective extraction of metals from solutions and pulp in the metallurgy of noble and rare metals, specially developed ion-exchange sorbents are widely used, which are capable of selectively extracting metals from solutions and pulp. Ion-exchange sorbent (composite chemical reagent - sorbent) is widely used in the metallurgy of non-ferrous, noble and rare metals.

The macromolecule of an ion-exchange sorbent consists of flexible intertwining threads of polymer molecules, the carbon chains of which have cross-links - "bridges" that form a network structure, the so-called matrix. The matrix contains immobile charged groups, the nature and amount of which can be controlled during the synthesis of the sorbent.

Active (functional) groups in cation exchangers are sulfate group (---SO_3O), carboxyl group (---COOH), hydroxyl group (---OH) and other more complex compounds. Anion exchangers contain amino groups of various degrees of substitution (---NH), (=NH), tertiary and quaternary ammonium bases as active groups. Depending on the purpose, sorbents with particles ranging in size from 0.3 to 2.0 mm are used in industry, the total surface of which varies from 0.2 to 300 m^2/g. The most important ion-exchange characteristic of the ion exchanger is the exchange capacity. It expresses the amount of ions sorbed by the ion exchanger under the accepted conditions.

To study the molybdenum sorption process, two sorption columns with a resin capacity of 3 kg each were prepared.

For selective sorption of the molybdate ion, an A-100 Mo type ion-exchange resin with the general formula $R\text{-}NO_3$ was used. Sorption of the sodium molybdate ion corresponds to the substitution reaction:

$$2R\text{-}NO_3+Na_2MoO_4 \dashrightarrow 2\ R\text{-}MoO_4+2\ NaNO_3 \quad (1)$$

The saturated resin was washed with technical water and molybdenum was desorbed with ammonia water according to the following reactions:

$$R\text{-}MoO_4+NH_4OH \dashrightarrow R\text{-}OH+ (NH_4)MoO_4 +OH^- \quad (2)$$

The ion exchange resin was again washed with water and converted to the nitrate form with nitric acid:

$$R\text{-}OH+HNO_3 \dashrightarrow R\text{-}\ NO_3 +H_2O \quad (3)$$

The solutions leaving the columns are a strong solution of ammonium molybdate with a Mo content of 80-90 g/l.

Molybdenum saturation of the first of the columns, into which the initial solution enters, is fixed by the change in the concentration of molybdenum in the solution at the outlet of the column.

A detailed analysis of the current state of artificial ion-exchange sorbents for the extraction of precious metals from the pulp in the laboratory and production conditions of the metallurgical industry has been carried out.

Based on the results of the study, it was revealed that the interaction of the sorbents chosen by us with noble metal ions provides a high degree of release of noble metals in the process of their extraction.

References

1. Bozorov A., Abed N., Kamalov T., & Negmatov J. (2023). Research of Technology of Processing Man-Made Waste of Molybdenum Production. In E3S Web of Conferences (Vol. 449, p. 06010). EDP Sciences.

2. Bozorov A. N., Negmatov S. S., Erniyozov N. B., Subanova Z. A., & Sultonova I. Q. (2023). Investigation of the sorption method of processing molybdenum-containing raw materials to extract rare metals. In E3S Web of Conferences (Vol. 401, p. 03045). EDP Sciences.

3. Бозоров Аминжон Нуриллоевич, & Сафаров Азамат Расул Угли (2021). Гидрометаллургическая переработка молибденсодержащего сырья и отходов молибденового производства. Труды Кольского научного центра РАН, 12 (2 (5)), 26-29. DOI:10.37614/2307-5252.2021.2.5.006.

4. Bozorov A. N., Mikhridinov R.M., Negmatov S.S., Sharipov Kh.T. The Influence of Different Processing Parameters on the Properties of Molybdenum Powder. International Journal of Advanced Research in Science, Engineering and Technology (India). Vol. 7, Issue 6, June 2020, pp 14087-14089.

5. С.С. Негматов, К.С. Негматова, М.Э. Икрамова, А.Н. Бозоров. Физико-химические методы анализа исходных сорбентов и их комплексов с йодом. «Композиционные материалы», Ташкент, 2020, №2, -С.177-182.