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FLOTATION RECOVERY OF MOLYBDENITE

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This invention relates to the seperation of molybdenite (MoS_2) from ores also containing sulfides of other metals. More particularly, this invention relates to the separation of molybdenite from flotation concentrates containing molybdenite and sulfides of other metals, particularly iron and copper.

The major source of metallic molybdenum is from molybdenite. Molybdenite occurs most frequently associated with sulfides of other metals, such as copper and iron, and is recovered with these other sulfides by concentration processes. Because the molybdenite commonly occurs in low concentration in these ores, it is only a minor constituent of the copper-iron concentrates, and its recovery presents a major problem. The present invention represents an efficient, simple and economical solution of this problem.

It has been recognized that the collector reagents such as organic thiophosphates or xanthates, commonly used for producing the copper concentrates, leave a residue in the concentrates which interferes with subsequent recovery of molybdenite by the usual flotation methods. To obviate this difficulty, such concentrates containing molybdenite have been subjected to a roasting or steaming treatment before the molybdenite is recovered. Such heating treatments are expensive and impractical unless the tonnage to be treated is relatively small and rich in molybdenite. Also, even under the best conditions, considerable amounts of molybdenite are lost and the efficiency of molybdenite recovery is not as high as would be desirable.

A molybdenite concentrate must contain a very high proportion of MoS_2 and no more than small amounts of copper and other values in order to be usable directly and without further processing in the production of molybdenum. For example, a molybdenite concentrate must contain at least 85% MoS_2 and less than 1.5% Cu in order to be considered high grade.

It is a primary object of this invention to provide a method whereby high grade molybdenite concentrates can be obtained directly and efficiently by flotation treatment of a copper concentrate without any preliminary roasting, steaming or heating.

A further object is to provide such a method in which only inexpensive reagents are used to float the molybdenite selectively.

Another object is to provide such a flotation procedure for producing high grade molybdenite concentrates from copper concentrates containing as little as 0.25% of MoS_2, and still achieve

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a high efficiency or percentage recovery of the molybdenite in the original material processed.

Other objects and advantages of the invention will be apparent from the disclosure which follows and from the flow sheet in the appended drawings.

In the drawings,

Figure 1 is a flow diagram of the preferred process of the invention.

Figure 2 is a flow diagram showing the countercurrent flotation cells used in the final cleaner flotation step.

We have discovered that copper concentrates containing relatively large amounts of copper and iron sulfides and low amounts of molybdenite can be processed directly by flotation methods without any preliminary chemical or heat treatment to obtain a high grade molybdenite concentrate. Furthermore, over 70% of the MoS_2 in the original copper concentrate can be recovered in this form, and the only reagents required are a ferrocyanide and sodium cyanide in addition to an acid, such as sulfuric acid, where pH adjustments are necessary.

The initial copper concentrate which is processed may have been obtained by using the conventional thiophosphate or xanthate collector and frothing agents, and may contain as little as 0.25%, or even less, of MoS_2, with 25% or more each of Cu and Fe in the form of a mixture of sulfides.

The process of our invention consists essentially of a rougher flotation and several cleaning stages during which an iron cyanide compound is used as reagent, and a final cleaning with an alkali metal cyanide. Throughout the procedure, the pH is carefully controlled and adjusted where necessary by acid addition, and the pulp density is controlled and varied from stage to stage. The tailing from the rougher flotation contains most of the copper values and becomes the copper concentrate that goes to the copper smelter. The concentrate from the rougher flotation contains the bulk of the molybdenite and is gradually upgraded as it progresses through the various cleaning stages until the final high grade molybdenite concentrate is obtained from the last cleaning operation. The tailings from the first cleaner flotation are returned to the feed for the rougher flotation, while the tailings from later cleaning stages are returned to other points in order to provide a closed circuit operation.

The copper concentrate may be used as feed just as it comes from the copper concentration plant. Such a concentrate usually has a high pH