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FLOTATION PROCESS FOR OXIDIZED MANGANESE ORE

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The present invention relates to flotation processes and flotation reagents for use in the separation of minerals, with particular reference to the concentration of oxidized metallic ores, such as the oxidized ores of manganese.

It is an object of my invention to provide a flotation process which gives improved recoveries and higher grade concentrates, at lower costs of operation, in the flotation of oxidized metallic ores.

Another object of my invention is to provide flotation reagents which are cheaper and more easily prepared than any now known in the art.

Another object of the invention is to provide a flotation process which gives efficient recoveries of valuable ore concentrates in the treatment of highly refractory oxidized metallic ores, such as the oxidized ores of manganese that exhibit pronounced "sliming" characteristics when ground to a size permitting separation of the ore minerals from the gangue.

Further objects and advantages of the invention will become apparent from the following description.

It has heretofore been proposed to carry out the concentration of oxidized alkaline earth ores by flotation in the presence of a flotation reagent consisting of a soap or highly alkaline dispersion made from the mixture of fatty and resin acids, known as "talloel," that is recovered as a by-product in the manufacture of paper and pulp from resinous woods by the "kraft" or sulfate process.

According to this prior practice, purified talloel is either saponified with sodium hydroxide or other caustic agent and then added to a watery pulp of the ore, or the talloel is added to an ore pulp which has been made alkaline with a suitable caustic agent, thereby forming the soap "in situ," the amount of caustic being regulated to maintain a high degree of alkalinity in the pulp after the addition of the talloel.

A characteristic of these known procedures is the production of a voluminous froth which is extremely difficult to handle in the actual flotation process. The frothing characteristic of talloel soaps, or talloel in alkaline solutions, has imposed serious limitations on the application of talloel as a flotation agent for ores of diverse qualities.

This difficulty is especially marked when treating ores containing a gangue material that has been reduced to a fine state of division, or "slime" as known in the art, in the grinding operations which are necessary to free the ore materials from the gangue in order that a flotation separation may be effected. The tendency for talloel soap, or talloel in highly alkaline pulps, to give a voluminous tenacious froth is even more serious when both the ore and gangue materials have pronounced sliming characteristics. The low grade manganese ores of Eastern Cuba are a notable example of this type of ore. Sliming ores are especially hard to concentrate with talloel soap, or by the addition of talloel to highly alkaline pulps, because the slime, much of which may extend into the true colloidal range, tends to stabilize the froth. This tendency of slime to stabilize the froth is especially marked in pulps of high alkalinity. Stabilization of the froth lessens the chance for coarse gangue particles to fall back into the pulp; therefore, there is a lowering of the grade of the concentrate due to mechanical entrainment of gangue. Moreover, since the forces of surface tension are greater than the forces of gravity on extremely fine particles, all of the slime in the froth goes over with the ore minerals particles and entrained coarse gangue particles. The mechanical carry-over of both coarse gangue and slime produces a low grade concentrate which is difficult, and in many cases, impossible to clean to a grade that is marketable.

In order to minimize difficulties heretofore encountered in the flotation of sliming ores, it has been necessary to classify the ore pulps into selected sizes before the flotation treatment; in other words, pulps are used which have been subjected to some type of de-sliming process, such as by mechanical or hydraulic classification, or by simple decantation of fine material. Classification to any selected size range before flotation naturally increases the loss of valuable minerals in the fine sizes, and when both the ore and gangue minerals have a tendency to slime the losses make such treatment economically impractical.

It has also been proposed to use a neutral hydrocarbon oil, such as gas oil or fuel oil, along with talloel soap, etc., in an attempt to overcome the excessive froths produced with the known process and reagents. When treating a selectively sized flotation feed this expedient has met with some success, but with unclassified pulps, especially with ores containing slimy gangue, slimy ore minerals, or both, the use of the auxiliary hydrocarbon oils has been of little value; when employed to any appreciable advantage, a large quantity of oil is required.