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UNITED STATES PATENT OFFICE.

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CONCENTRATION OF OXIDIZED ORES.

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My invention relates to a process for the concentration of oxidized ores of the kind in which the concentration is operated by means of flotation.

As it is well known, in such a process a pulp is firstly formed, this pulp consisting for instance in a mixture of substantially one part of ore which has been finely ground, and of four parts of water; this pulp is afterwards introduced into an apparatus where it is submitted to an agitation caused by mechanical means for instance by aid of a shaft provided with paddles or by an injection of air. To this mixture of water and ore, oleic acid and soda carbonate are then added in such a manner that, under the action of the agitation, a persisting foam is produced; the oiled mineral particles are thus attracted to the air bubbles, are separated from the pulp and float to the surface.

The foam charged with the mineral particles of oxides is then collected and secures a more or less rich concentrate.

Generally speaking these processes have never given good results with regard to the efficiency and the richness of the concentrates as indeed the oxidized minerals are not readily collected by the oils.

The process which forms the subject matter of the present invention has for its purpose to increase the yield or to secure concentrates of a greater richness.

With this object in view, it is distinguished from the processes already known, by the introduction in the pulp, together with oleic acid, of more or less rancid palm oil that is to say of palm oil which has been subjected to the action of air for a more or less long time, so as to have acquired a certain acidity.

In carrying the invention into practice, oleic acid is mixed intimately with palm oil in the proportion of substantially one to four parts of palm oil for one part of oleic acid, this mixture being slightly heated so as to increase its fluidity it is then introduced into the pulp at the moment that this latter enters into the first flotation cell. The two reagents may however also be introduced separately and successively but it is better to introduce them simultaneously. When operating as above stated it will be observed that the foam which is produced by the agitation in the flotation apparatus is comparatively more abundant and more stable and that it has collected a greater proportion of ore particles. In other words, the concentrate which is obtained is richer for a same coefficient of extraction.

If less than one part of palm oil is used for one part of oleic acid, the results are hardly better than with the use of oleic acid only; if more than four parts of palm oil for one part of oleic acid, the results are hardly better than with the use of oleic acid only; if more than four parts of palm oil for one part of oleic acid are used, the efficiency decreases again. There is consequently a given proportion which secures the most favourable results and this proportion corresponds to 1 to 4 parts of palm oil for one part of oleic acid, the exact proportion depending on the quantity of palm oil, more or less rancid, which is employed, and also on the nature of the ore.

The exact function of the more or less rancid palm oil used conjointly with oleic acid has not been ascertained but it is to be supposed that the fatty acids contained in the rancid palm oil add their action to that of the oleic acid; in fact the oil itself and also the products of decomposition and oxidation which are produced in the rancid palm oil also exert a favourable effect on the operation of flotation itself. Whatever may be the exact action however, a multiplicity of experiments show that a mixture of palm oil, more or less rancid, and of oleic acid secures a reagent which is far better than oleic acid alone.

The foam is more stable, more abundant, and the mineral particles are better oiled and collected.

In order to show more clearly the improved action which is secured by the use of palm oil, results are given hereafter which have been obtained by treating on the one hand with oleic acid alone and on the other hand, with a mixture of oleic acid and palm oil the same copper carbonated ore.

By using oleic acid alone, the ore at 5.339% of copper being ground at 60 meshes, the following proportions of reagents have been used:

Oleic acid	1.632	K. per ton of ore.
Soda silicate	0.960	" " " "
Soda carbonate	1.228	" " " "

and the results have been:

Concentrates	20.253%	Cu.
Tailings	1.937%	Cu.
Rates of concentration	5.400:1	
Extraction	70.458%	Cu.

By using palm oil in combination with oleic acid the following quantity of reagents has been used:

Oleic acid	0.677	K ton of ore.
Palm oil	1.437	" " "
Soda silicate	0.731	" " "
Soda carbonate	0.992	" " "

and the results have been:

Concentrates	34.085%	Cu.
Tailings	1.854%	Cu.
Rates of concentration	8.600:1	
Extraction	70.760%	Cu.

It will be seen that with a same coefficient of extraction concentrates at 34% have been obtained in the second case instead of at 20% in the first case.

What I claim is:

1. The process of froth flotation consisting in adding to a pulp of oxidized ores palm oil and oleic acid in a proportion of between one and four parts of palm oil to one part of oleic acid, treating the mixture to form a froth carrying the oxidized values and separating the froth.

2. The process of froth flotation consisting in adding to a pulp of oxidized ores, rancid palm oil and oleic acid, treating the mixture to form a froth carrying the oxidized ores and separating the froth.

In testimony whereof I have affixed my signature.

THOMAS SAMUEL CARNAHAN.