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FROTH FLOTATION PROCESS

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The present invention relates to the production of an improved froth flotation agent for concentrating ores and the like and to a method for the concentration of ores and like materials with such improved flotation agent.

It is an object of the present invention to provide a froth flotation agent of high efficiency from the less efficient turpentines.

The present application is a continuation-in-part of my co-pending application S. N. 194,207, filed March 5, 1938.

In froth flotation processes finely ground crude ores are agitated in a liquid bath such as water, containing flotation agents (foaming agents) by the introduction of a finely divided current of a gas such as air. Concentrated ore adheres to the foam which is formed at the top of the liquid bath whereas the gangue remains at the bottom of the flotation vessel. The results obtained in such a flotation process depend on the efficiency of the froth flotation agent employed.

Pine oil has been employed for many years as a flotation agent for the concentration of ores, whereas turpentines have proved to be very poor flotation agents.

It has now been discovered, in accordance with the present invention, that very excellent froth flotation agents may be prepared from turpentines by hydration thereof such as, for example, by treatment with acids or acid anhydrides and subsequent hydrolysation of the reaction product.

The starting materials employed in accordance with the present invention are turpentine products such as those obtained at lower temperatures in the steam distillation or extraction of pine wood, the dry distillation of certain pine woods, balsam turpentine or spirits of turpentine, and especially sulfate turpentine which is obtained as a by-product in the production of wood pulp from terpene-containing pine wood by the sulfate process.

These crude turpentine products may, for example, be treated in accordance with the present invention with HCl until no more of the HCl is taken up. The resultant product is then hydrolysed by heating with water or dilute aqueous alkaline solutions. The hydrolysed product is then purified, for example, by fractional distillation and forms an excellent flotation agent. If desired, this product may be improved by fractionation and recovery of the fraction boiling above about 200° C., especially a fraction boiling between 200° C. and 220° C.

Instead of hydrogen chloride, other acid materials may be employed, for example, sulfuric acid or acetic anhydride, in the presence of a small quantity of sulfuric acid. It is also possible to reflux turpentine with twice its volume of 20% sulfuric acid whereby the desired hydration takes place directly without a supplemental hydrolization step.

The following example serves to illustrate a mode for the preparation of an improved flotation agent from turpentine.

Example

Hydrogen chloride is bubbled through crude turpentine obtained by the dry distillation of conifer wood at normal or slightly raised temperatures until no more hydrogen chloride is taken up by the turpentine. This treatment requires approximately two to three hours.

The reaction mixture thus obtained is mixed with about an equal volume of water or a dilute aqueous alkaline solution such as a dilute solution of sodium carbonate. This mixture is then refluxed for about four hours whereby the hydrogen chloride taken up by the turpentine is hydrolysed.

The hydrated product is separated from the aqueous layer by decanting or extraction with ether and then dried with dehydrated sodium sulphate and fractionated.

The hydrated reaction product is obtained in a yield of 85% to 90% and is an excellent froth flotation agent.

Instead of turpentine obtained by the dry distillation of wood turpentine from other sources such as, for example, sulphate turpentine may be treated in an analogous manner to produce an excellent flotation agent.

When employing the hydrated turpentine products obtained in accordance with the present invention as the froth flotation agent in known flotation processes for concentrating ores and like materials, excellent stable homogeneous foams are produced which possess a good concentrating effect.

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