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ELECTRODEPOSITION OF COPPER POWDER

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12 Claims. (Cl. 204—10)

This invention relates to the preparation of copper and particularly to the electrodeposition of copper in flake form.

Copper powder is used as a pigment ingredient in the most durable types of paint for the coating of steel and wood in manufacturing plant maintenance, for antifouling paints, under-water ship hull paints and for other marine paints. Such paints, including air-drying varnish vehicles, have the property of retaining a certain degree of plasticity or "life," thereby resisting the embrittling effect of prolonged weathering, which causes many other types of paint to fail by checking, cracking and flaking. Copper paints have been shown to be excellent for prime coats as well as for overcoats for metal painting.

Copper is also sometimes present in paints as one of the constituents of a flake material referred to in the trade as "bronze" powders. So-called "gold" paint, for example, is a bronze powder made from an aluminum-copper alloy having a golden lustre. Other metal pigments containing copper are made in colors from bronze to that of copper. Even the so-called "copper-bronze" paints, however, are made from copper alloyed with other metals, principally zinc. The pigment powders for all these copper alloy paints, in common with aluminum powders, have been made in the past by the pounding of the alloy into the form of very fine flakes. Pure copper is not readily reduced to flake powder in this way and for this reason, in the past, it has been necessary to alloy it with some other metal adapted to give this property.

Copper powders have been produced in the past by electrodeposition, but such powders have consisted of minute particles of dendritic metal similar in shape to a pine tree. Also, such depositions have required special technique in the electrodeposition, such as unusually high current densities and unusually low acid and copper concentrations in the electrolyte.

An object of the present invention is to provide a process whereby pure copper may be electrolytically deposited in flake form. A further object is to provide means and a method for controlling the conditions in the electrolytic cell so that the copper will be deposited in flake form. Another object is to provide such a process by which the flake copper so deposited will be coated with an oily or greasy film.

It is also an object to provide a process for producing copper in flake-like form under the normal conditions of electrolyte composition, temperature and current density used in tank

room copper refining, and thereby to perform the operations of refining the copper and reducing it to flake form in a single step with very little additional cost of power and labor over that required for the production of ordinary cathode copper.

It is another object to produce a new product and a new procedure useful in the preparation of copper paints and other copper-containing products. Other objects will become apparent.

It has now been found that by electrolytically depositing copper upon a cathode in an electrolytic cell, which cathode is coated with a particular type of film, the copper so deposited will be in the form of an aggregate made up of individual flake-like or laminar particles instead of the usual tree-like particles and that such particles will be coated with a coating resulting from the film used. The selection of the film and the control of the oxidizing properties of the electrolyte during the electrodeposition are important in obtaining the desired results.

It has been found, for example, that a vegetable oil (or other glyceride oil or the fatty acid, or other derivative containing the fatty acid radical, corresponding to the glyceride of the oil) containing a saturated or an unsaturated hydrocarbon chain together with one or more hydroxyl groups, and having a certain degree of oxidation, may be used to form the film on the cathode. The coating applied may be one that already has the required degree of oxidation or the required degree of oxidation may be obtained by controlling the oxygen content of the electrolyte. Important characteristics of the present preferred materials forming the film on the cathode during the electrodeposition are first, that they contain fatty oils, fatty acids or derivatives of these containing the fatty acid radical, or mixtures of two or more of these, in which there is present in the free or combined fatty acid radical, one or more hydroxyl groups, and secondly, that there must be present in the oil a definite degree of oxidation, perhaps accompanied by the formation of peroxide groups in the fatty acid radical. The coating on the cathode may also contain other substances, such as lubricating agents, or other agents useful in preparing, or for modifying the character of, the finished powder. Such other substances should be present in sufficient quantities to give the desired effect, but in insufficient quantities to deleteriously affect the electrodeposition of the flake copper.

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