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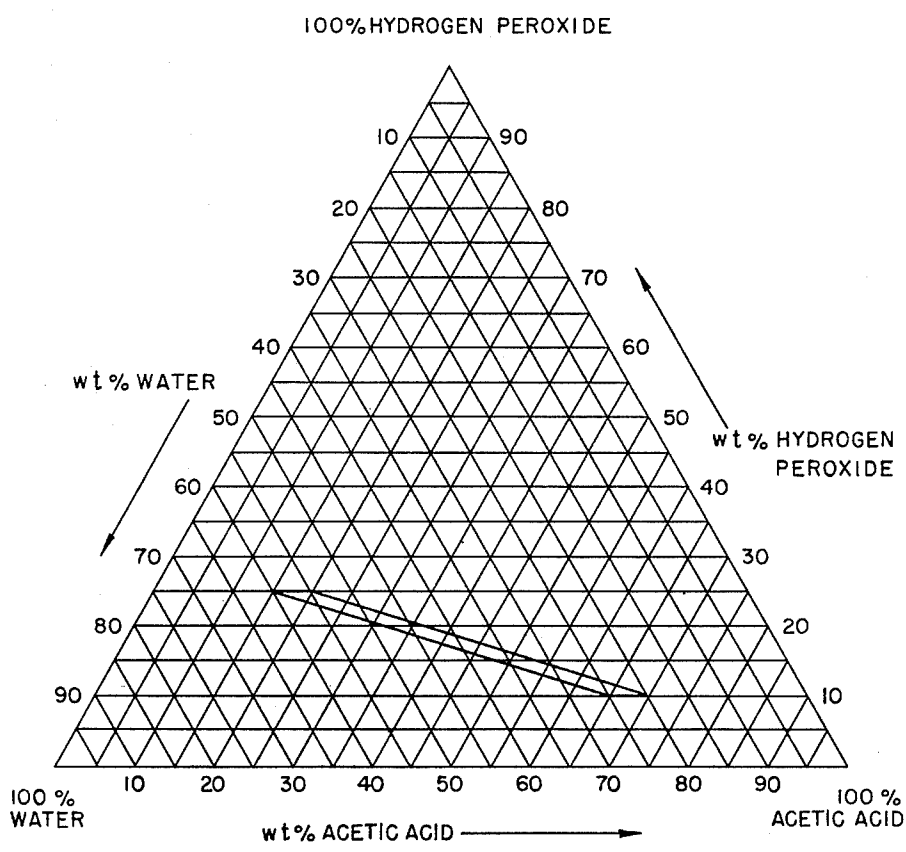
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METHOD FOR CHEMICALLY POLISHING LEAD

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METHOD FOR CHEMICALLY POLISHING
LEAD

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This invention relates to a method for chemically polishing lead, more particularly for imparting a polish of high luster to lead.

It is well known in the art of metal plating that the plating reflects the smoothness of the surface plated and furthermore that the density of the plating and the freedom from pinholes therein is in large measure also dependent upon the smoothness of the plated metal surface. Surfaces of hard metals such as steel can be polished to a high degree of smoothness approaching a high lustre condition by mechanical polishing, that is by buffing the surface with the aid of fine abrasives. Lead, on the other hand, being a relatively soft metal cannot be worked up by buffing with the aid of fine abrasives to a smoothness of surface which approaches that of a high luster polish. The soft metal tends to tear under the action of the abrasives and particles of the abrasives become embedded in the surface of the lead.

Lead as a metal for ornamentation purposes finds little acceptance by reason of the fact that mechanical polishing of the metal even by buffing, with aid of fine abrasives, does not produce a high finish of pleasing appearance to the eye, but one which although bright lacks tone and in color partakes strongly of the nature of the metal, being of a lead-like gray cast.

It is a principal object of the invention to provide a method for chemically polishing lead which is productive of polished lead surfaces of high luster. It is a further object to provide a method for improving the surface of lead for the plating of metals thereon. It is a still further object to provide a method for rendering lead more attractive as a metal for ornamental purposes.

These and other objects are accomplished in accordance with the present invention in a method which comprises subjecting lead having a smooth surface in clean condition to vigorous agitation for a very short time in a polishing solution of hydrogen peroxide in aqueous acetic acid, the composition of which is hereinafter more fully set forth, until a high luster is attained on the lead surface and then quickly removing the polishing solution from the treated lead.

I have found that a polish of high luster approaching in brilliance and tone that of nickel and chrome finishes can be imparted to clear, smooth lead surfaces by polishing them in accordance with the method of the invention with a solution in water of between about 10 and 25% by weight hydrogen peroxide and between about 15 and 70% by weight acetic acid in which these

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solutes are present in inverse proportion and the weight ratio of acetic acid to hydrogen peroxide for each unit of 5 weight percent of acetic acid decreases with increase in the hydrogen peroxide content by a factor which is about 3.3% for each 1% increase in weight of the hydrogen peroxide.

As shown in the accompanying drawing, a graph drawn on triangular coordinate paper and plotted from the values for the three components of the polishing solution would be a parallelogram in which the pair of minor sides are of a length corresponding to the value of 5 weight percent of acetic acid and the pair of major sides slope downwardly from the high for the hydrogen peroxide content for the solution to the low for the same and move away from the low for the acetic acid content for the solution to the high for the same. Thus, polishing solutions may be used which contain 10% hydrogen peroxide and 70 to 65% acetic acid; 11% hydrogen peroxide and 65 to 60% acetic acid, etc., to 25% hydrogen peroxide and 20 to 15% acetic acid, all by weight, and the remainder water. A preferred group of polishing solutions range in hydrogen peroxide content from 13 to 17% by weight and in acetic acid content from about 60 to 42% by weight, with the remainder water. These preferred solutions may be made up, for example, with 13% hydrogen peroxide and from about 60 to 55% acetic acid and with 17% hydrogen peroxide and from about 47 to 42% acetic acid, etc. The polishing solutions can be prepared by adding strong acetic acid of known concentration, for example, glacial acetic acid (99.5%), and aqueous hydrogen peroxide of known concentration, for example, Superoxal (hydrogen peroxide 30%), in the proper proportions to the calculated amount of water and stirring the mixture to effect solution of the ingredients.

The smooth condition of the lead surface to be chemically polished by the method of the invention is a matter of having an even surface free from cavities and bumps. The smooth condition may exist by reason of previous working or manufacture of the lead surface, for example, by the casting of lead in molds with polished walls and the rolling of lead sheets. In the case of rough lead surfaces these may be brought to a smooth condition by buffing in known manner with a cloth buffing wheel and the usual buffing paste containing a fine abrasive such as magnesium carbonate powder, jewelers' rouge and lamp-black. A preferred buffing paste is one composed of a thick suspension of magnesium carbonate in water since such a paste can be easily removed

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from the polished lead surface by washing with water.

In the practice of the method of the invention, the lead surface to be polished, which may be of any geometrical pattern, is separately introduced into and agitated in the aqueous polishing solution of hydrogen peroxide and acetic acid. If more than one lead article is to be treated in the polishing bath at the same time care must be taken to avoid contact of the articles with each other since atomic welding of the articles to one another will take place in the presence of the polishing solution. Suitably, the lead articles to be polished are separately suspended in the polishing bath by means of a wire, hook or clamp attached to a disposable extension or tab on the article as is practiced in the metal plating art, or the articles are individually contained in a wire basket. The suspending or supporting means for the lead articles should be made of an acid resistant material such as aluminum or stainless steel. The time required for producing a polish of high luster on the smooth lead surface is very small, being but a matter of seconds. The lead article is vigorously agitated in the polishing bath for only such time as is required to observe the development of the high luster on the lead surface. It is then removed and promptly washed with aqueous acetic acid of a concentration not appreciably lower than that of the acetic acid in the polishing solution. Wash acid of a concentration in acetic acid which is up to about 5% less than that of the polishing solution can be used. By observing this practice in respect to the washing of the polished lead surface, not only is the polishing solution removed therefrom but, importantly, the introduction of any substantial amount of water into the polishing solution on the treated lead article is thereby avoided and by consequence, roughening of the polished surface. For a given content of hydrogen peroxide in the polishing solution, an increase in the water content and a decrease in the acetic acid content thereof causes roughening of the lead surface due to the fact that such diluted solutions attack the lead more vigorously.

The smooth lead surface should be clean before being subjected to the chemical polishing. In some instances this may require only the thorough washing of the lead surface with water. In others the use of organic solvents such as benzene may be required for the removal of greasy materials from the lead surface.

The invention is further illustrated by the following specific example of the application of the method to the polishing of a lead surface. Percentages of reagents are by weight.

Example

A lead article in the shape of a pedestal having integrally mounted thereon a one-half inch diameter sphere was buffed to produce a fairly smooth surface on the sphere. The buffing was done with a cloth buffing wheel using a buffing paste composed of powdered magnesium carbonate and water. The buffed lead surface was thoroughly washed with water to remove the

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buffing paste, rinsed with dilute (5-10%) acetic acid and quickly, while wet, immersed in a solution in water of 15% hydrogen peroxide and 50% acetic acid. The article was held by the pedestal portion while the sphere portion was vigorously agitated in the polishing solution. A polish of high luster was obtained on the surface of the sphere in a matter of a few seconds, almost instantly. The polished sphere was quickly washed with acetic acid of 50% concentration to remove the polishing solution and then with warm water to remove the acetic acid. The polished lead article is dried by an air blast or in any other way found suitable.

In the event that the polished lead article is to be plated with metal, such as copper, silver and the like, it is not dried but entered into the plating bath directly after the water wash in order to retain the maximum benefit of the clear, highly polished surface.

The high luster polish obtainable on lead surfaces by the method of the present invention is quite resistant to tarnishing in the atmosphere and may be conserved by coating the polished surface with a clear lacquer.

While I have described a specific embodiment of my invention by way of illustration, it is to be understood that the invention is not to be limited thereto but only as is required by the prior art and the appended claims.

The invention described herein may be manufactured and used by or for the Government of the United States of American for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed is:

1. A method of producing a polish of high luster on a lead surface which comprises immersing the lead surface in clean smooth condition into an aqueous polishing solution of hydrogen peroxide and acetic acid and vigorously agitating it therein for a time sufficient to develop a polish of high luster thereon, quickly washing the polishing solution from the lead surface with aqueous acetic acid of a concentration not appreciably less than that of the polishing solution and then washing the lead surface with water to remove the acetic acid, said polishing solution containing between about 10 and 25% by weight hydrogen peroxide and between about 15 and 70% by weight acetic acid in inverse proportion and in a weight ratio of acetic acid to hydrogen peroxide which for each unit of 5 weight percent of acetic acid decreases with increase in the hydrogen peroxide content by a factor which is about 3.3% for each 1% increase in weight of the hydrogen peroxide.

2. A method as defined in claim 1, wherein the aqueous polishing solution contains between about 13 and 17% by weight hydrogen peroxide and between about 60 and 42% by weight acetic acid.

References Cited in the file of this patent

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