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2,973,283

SURFACE TREATMENT

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The present invention deals with a surface treatment for articles made from platinum-rhodium alloys, such articles being, more particularly, apparatus for handling molten glass as, for example, glass forming dies or extrusion nozzles for the spinning of glass fibers.

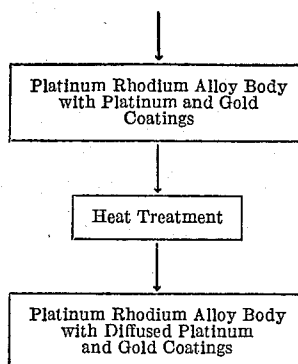
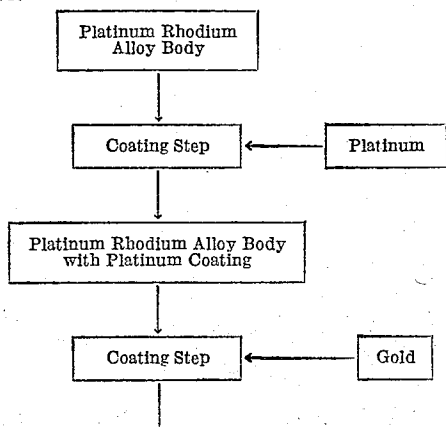
Alloys of platinum with up to about 50 percent rhodium have been suggested and used for the manufacture of many types of spinning nozzles for artificial fibers, these alloys combining the required properties for the purpose, to a large extent, such as hardness and corrosion resistance.

However, for apparatus handling molten glass, such as e.g. glass spinnerettes, a further requirement for satisfactory operation becomes important, i.e., the surface which is in contact with the molten glass should not be wetted thereby. This requirement is not satisfactorily met by the platinum-rhodium alloys used heretofore. On the other hand, it is known that platinum-gold alloys show a considerable resistance to wetting by molten glass, but they are mechanically insufficiently resistant, especially at the high temperatures of molten glass.

It has been found that the desired properties of hardness, and of non-wetting by molten glass, can be obtained by depositing, for example by electroplating or any other suitable method, a double coating upon an article of a platinum-rhodium alloy, which may be the portion of an apparatus which contacts molten glass, such as a spinnerette for spinning glass fibers, a die in a press or the like.

According to the invention, the article is coated with platinum, and then a coating of gold is applied upon the platinum layer whereupon the article is heated to diffusion temperature, preferably by placing it in a furnace at about 800° C. and gradually raising the temperature to about 1200° C. The heat treatment causes the metals to diffuse into each other whereby, in the different boundary zones, solid solutions are formed, thus insuring that the coatings adhere firmly to each other and to the platinum-rhodium surface.

A flow diagram illustrating the order of steps is as follows:



The coatings of platinum and gold may be in the range of about 0.0001 to about 0.001 inch and good results have been obtained with layers of about 0.0005 inch.

Moreover, it has been found by tests made with platinum-rhodium alloys containing 10 percent to 40 percent by weight rhodium that the surfaces obtained display a combination of properties which the single components do not shown. The surfaces are extremely repellent to molten glass, due to the predominating content of gold in the outer layer, wherein some platinum but practically no rhodium is present, but at the same time the hardness is increased beyond the hardness the original platinum-rhodium alloy would have attained, when subjected to the same heat treatment, without being coated or if coated with one of the components only.

It is believed that this result is due to the formation of solid solutions which are gradually enriched in gold near the surface whereas an increasing content of rhodium is present deeper in the metal. The intermediate layer of platinum prevents undesirable diffusion between the rhodium content of the alloy and the gold coating, thus acting simultaneously as a buffer and as a bonding agent between the platinum-rhodium alloy and the gold layer.

It will be obvious to those skilled in the art that many modifications may be made within the scope of the present invention without departing from the spirit thereof, and the invention includes all such modifications.

What is claimed is:

1. A surface treatment for articles made from platinum-rhodium alloys which comprises coating the surface with platinum, subsequently applying a coating of gold upon the platinum layer, each of the coatings being sufficiently thick to allow the formation of boundary zones of solid solutions, and heating to diffusion temperature to harden the outer surface of the article to a hardness at least equal to that of the platinum-rhodium alloy by the formation of said solid solutions.

2. A surface treatment for articles made from platinum-rhodium alloys which comprises coating the surface with platinum, subsequently applying a coating of gold upon the platinum layer, each of the coatings being sufficiently thick to allow the formation of boundary zones of solid solutions, heating to about 800° C. and gradually raising the temperature to about 1200° C. to harden the outer surface of the article to a hardness at least equal to that of the platinum-rhodium alloy by the formation of said solid solutions.

3. A surface treatment for articles made from platinum-rhodium alloys which comprises coating the surface of the article with a layer of platinum, subsequently applying a coating of gold upon the platinum layer, each of the coatings having a thickness of about 0.0001 to about 0.001 inch, and heating to produce diffusion of platinum metal from the platinum layer into said article and into said gold coating.

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4. A surface treatment for articles made from platinum-rhodium alloys which comprises coating the surface of the article with a layer of platinum, subsequently applying a coating of gold upon the platinum layer, each of the coatings having a thickness of about 0.0001 to about 0.001 inch, and heating to about 1200° C.

5. A surface treatment for articles made from platinum-rhodium alloys which comprises coating the surface of the article with a layer of platinum, subsequently applying a coating of gold upon the platinum layer, each of the coatings having a thickness of about 0.0001 to about 0.001 inch, heating to about 800° C. and gradually raising the temperature to about 1200° C.

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