

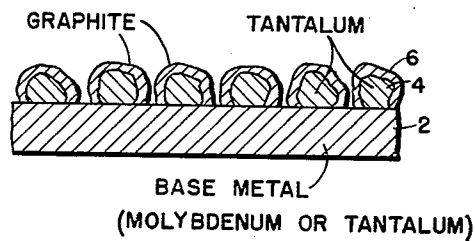
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LOW PRIMARY AND SECONDARY ELECTRON EMISSION SURFACE

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WITNESSES:

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LOW PRIMARY AND SECONDARY ELECTRON
EMISSION SURFACE

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2 Claims. (Cl. 117-26)

1

Our invention relates to an electronic electrode and more particularly to an electrode having a low primary and secondary emission surface for use in a vacuum tube.

In accordance with the prior art of which we are aware, it is known that an ordinary carbon or graphite surface has a low secondary emission ratio which is about unity. Such a surface being black will be substantially cooler than would other surfaces of a lighter color and hence have a low primary emission. It is also known that a surface comprising finely powdered carbon on a piece of base metal has a much lower secondary emission ratio, e. g. about .5. However, these carbon powders cannot be made to stick to the base metal tightly enough for many applications.

It is accordingly, an object of our invention to provide an electrode having a surface with a very low secondary emission coefficient, the surface of which adheres tightly to a base metal.

Another object of our invention is to provide an electrode which operates effectively as if it had powdered carbon adhering thereon tightly.

The invention with respect to both the organization and the operation thereof, together with other objects and advantages may be best understood from the following description of specific embodiments when read in connection with the accompanying drawing, in which:

The single figure is an enlarged showing in cross-section of apparatus built in accordance with one embodiment of our invention.

In accordance with one embodiment of our invention, we provide an electrode for a vacuum tube comprising a supporting base metal 2 preferably of molybdenum or tantalum. In accordance with the preferred embodiment of our invention, this base metal is prepared with a smooth surface. A layer 4 of fine particles of tantalum powder is then painted or sprayed on the base metal and fired or sintered so as to cause the tantalum powder 4 to adhere to the base metal 2. The firing or sintering is performed so that a strong adhesion is obtained between the powder 4 and the base metal 2 while retaining substantially the granular structure of the tantalum powder. There is, thus, provided a coating on the surface of the base metal 2 which is substantially a layer of small particles of tantalum. The powdered tantalum surface 4 which has been caused to adhere to the molybdenum base 2 is then graphitized by heating it in a hydrogen atmosphere containing benzene vapor, in accordance with principles well known in the art so

2

as to form a very thin adherent layer of graphite 6 around the exposed portions of the particles of tantalum powder 4. The layer of graphite 6 is preferably much thinner than the diameter of the particles of tantalum powder 4.

A structure built in accordance with this embodiment of my invention has the advantage that electrons which are emitted from the region between the particles of graphite coated tantalum powder 4, 6 are likely to strike another particle of graphite coated tantalum powder 4, 6 rather than move out into the open space beyond.

Our electrode, therefore, has the advantage of granulated carbon in that it produces a very low secondary emission ratio. However, in addition, our electrode has the advantage that the surface which provides the low secondary emission is tightly connected to the supporting metal base.

It is understood that in some applications it may be desirable to build the body of the electrode of a material other than molybdenum or tantalum. If such is the case, it is understood that the molybdenum or tantalum which are referred to as the base metal might be a coating on the outside of an electrode, the main structural body of which could be made of another material such as, for example, copper.

Although we have shown and described specific embodiments of our invention, we are aware that other modifications thereof are possible. Our invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and the spirit of the invention.

We claim as our invention:

1. An electronic electrode comprising: a metallic supporting element, a plurality of small particles of tantalum powder fastened to said element, and a coating of graphite on the exposed surfaces of said particles.

2. An electronic electrode comprising: a supporting element having a surface of a material of the group comprising molybdenum and tantalum, and a plurality of small graphitized particles of tantalum powder sintered onto said element.

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