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ELECTRODE ALLOY

No Drawing. Application filed July 30, 1930. Serial No. 471,695.

My invention relates to electrode alloys and especially to electrode alloys for glow discharge tubes employed in the reproduction and transmission of pictures and sound.

An object of my invention is to provide an electrode that will sputter very little or not at all.

Another object of my invention is to prolong the useful period of a tube used as a television-receiving tube by preventing sputtering at the cathode and concentration of the glow at various points of said cathode.

More specifically an object of my invention is to form the cathode of a television-receiving tube out of a material that will not appreciably sputter or have its glow concentrated at any particular point and so lengthen the useful life of such tube to twenty or thirty times the length of life of the present day television tube.

Other objects of my invention will become evident from the following detailed description.

Television-receiving tubes constructed of a plane plate to be used as a cathode and preferably of a pair of such plates spaced parallel by a distance substantially that of the mean free path of an electron of the gas in the tube have been found to have a very short life of ten or twelve hours of useful operation. Such a type of tube is described in the copending application of Dewey D. Knowles, Serial No. 337,699, filed February 5, 1929.

It has been found that the shortness of life of these tubes with plate electrodes, generally of aluminum oxide, has been due to the plate sputtering while acting as the glow-cathode. This sputtering of the cathode deposits a film on the interior of the glass that gradually obscures the view of the glow of the cathode. These aluminum oxide plates also have the disadvantage that, if the oxide is pierced at any point, a glow will concentrate on said point and, therefore, will not be evenly distributed over the surface of the plate. According to my invention, I provide a cathode plate that will not sputter appreciably and will thus lengthen the life of the tube to two hundred or three hundred operative hours, in place of the ten or twelve operative hours to which the tubes of the prior art were limited.

The material that I have found that produces this unexpected length of life of the tube is a nickel-cobalt alloy and especially a nickel-cobalt-iron alloy containing a material such as titanium, zirconium or thorium which class of materials has an amphoteric hydroxide. The particular material of this class that I have found desirable for use in the cathode is titanium.

Titanium, especially in the proportions such as is used in Konel metal, is particularly suitable for use as cathode material in television tubes. The following preferred proportions are given by way of example although the specific proportions might be varied within certain limits. The composition is preferably of

	Per cent
Nickel	70
Cobalt	20
Iron	8
Titanium	2

These proportions may be varied as taught in my copending application Serial No. 403,664, filed October 30, 1929. As mentioned above zirconium or thorium may be substituted for the titanium.

This alloy is formed into plates of the desired thickness. It is first vacuum treated and then cleaned and polished, as by running over a buffing wheel. The plates are then cut to the desired size and assembled into the tube. The tube is then evacuated and filled with a noble gas at less than atmospheric pressure, such as neon at 15mm of mercury pressure.

The polished plates of Konel metal have also the advantage of maintaining their high luster throughout the necessary handling incident to the mounting and sealing in the tube. Konel also has a high mechanical strength which provides a very rigid construction.

The invention may also be applied to tubes of other types where it is desired to reduce the sputtering of an electrode in discharge devices. As specific instances of such appli-

cation of the invention, I would mention hot-cathode rectifiers, anodes in gaseous discharge rectifiers where the cathode was large in area and the anode correspondingly small in area, and also glow lamps of various kinds, such as neon lamps for signs or in landing field illumination.

Accordingly, I have discovered a material for the cathode plates of television tubes that produces the unexpected result of lengthening the lives of such tubes to twenty or thirty times the average life of a tube of the prior art.

My invention is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

I claim as my invention:

1. In an electrical glow discharge device an electrode having a surface comprising a nickel-cobalt alloy containing a material having an amphoteric hydroxide.

2. In an electrical glow discharge device an electrode having a surface comprising a nickel-cobalt alloy containing titanium.

3. In an electrical glow discharge device an electrode having a surface comprising a nickel-cobalt-iron alloy containing a material having an amphoteric hydroxide.

4. In an electrical glow discharge device an electrode having a surface comprising a nickel cobalt-iron alloy containing titanium.

5. A television lamp having a cathode having a surface consisting of a plate of a nickel-cobalt alloy containing a material having an amphoteric hydroxide and an anode cooperating with said cathode.

6. A television lamp having a cathode having a surface consisting of a plate of nickel-cobalt alloy containing titanium, and an anode cooperating with said cathode.

In testimony whereof, I have hereunto subscribed my name this 15th day of July 1930.

ERWIN F. LOWRY.