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EMISSIVE COATING FOR CATHODES AND METHOD FOR PREPARING THE SAME

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The present invention comprises an improved emissive coating for cathodes and a method for preparing the same.

It has previously been proposed to modify cathode coatings by admixing metallic particles with the electron-emissive materials employed. Insofar as the processes used heretofore contemplate applying the refractory substance in the form of a metallic powder the results obtained have not been entirely satisfactory. Due to the relatively large size and smooth surfaces of the grains of the pulverized metal, the degree and character of their dispersion in the active material have failed to be such as sensibly to improve the quality of the resulting coating.

In accordance with our present invention the carbonates of metals such as nickel or cobalt are carefully combined with alkaline earth metal carbonates before application thereof to the cathode surface. By thus providing for the simultaneous reduction of the two compounds we insure a thoroughly admixed and relatively homogeneous product. As a result, we find that the life and emissivity of the cathode are increased in a manner heretofore unattainable by any of the prior processes of which we are aware.

In the practice of our invention, we have found it convenient to take suitable proportions of the carbonates of one or more of the alkaline earth metals, such as strontium or barium, and add thereto a small percentage (in the neighborhood of 5%) of the carbonate of a metal such as nickel or cobalt. This combination should be in finely powdered form and should be carefully mixed to insure a thorough dispersion of the metal carbonate throughout the mass. In some cases it may be desirable to add certain additional substances, such for example as strontium nitrate.

For simplifying the application of the mixture to the cathode surface it may be converted into a plastic or fluid state by using a binder such as a starch paste or a suitable gum or cellulosic material. The substance obtained in this manner may then be coated on the cathode surfaces by a spraying or immersion process. When the coating thus formed is heated by placing the cathode body within a furnace either in vacuum or in a reducing atmosphere, the carbonates will be decomposed into oxides of barium, strontium, or nickel as the case may be. It is believed that the oxides are further reduced to pure metal substances during heating and subsequent use.

We have found that by following the procedure above described the refractory metal or oxide obtained by the reduction of the carbonate will be dispersed through the electron emissive coating in a fine powder. The nature of the resulting coating is such as to present a distinctive black or gray-black appearance. This is entirely different from the ordinary cathode surfaces, which consist only of oxides of the alkaline earth metals and present a white color.

According to tests which have been made by the present inventors, the electron emission of cathodes made in accordance with the above described invention is far greater than that of the cathodes of the prior art. In addition, the useful cathode life is considerably extended. While a complete explanation of these improved characteristics is not attempted, it is believed to be due in part to the fact that a chemical compound (barium-nickelite in the case of nickel) is formed combining the alkaline earth metal and the refractory metal. Such compound may then act as a barium storage means which serves during operation of the cathode to restrain rapid vaporization of the active material but which provides a continuously renewed electron-emissive layer.

A further and complementary explanation may lie in the superior heat-radiating qualities of the interspersed finely divided refractory metal particles. It is considered that these may serve to equalize the temperature distribution throughout the cathode surface and thus to produce uniform electron-emission. In this way, localized vaporization of the alkaline earth material due to the development of concentrated discharge areas is substantially eliminated.

While we have exemplified our invention by particular reference to nickel as a suitable refractory metal, it will readily be understood that equivalent materials such as cobalt may be alternatively used.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. The method of preparing a cathode surface which comprises coating the same with alkaline earth metal carbonate thoroughly mixed with a small percentage of nickel carbonate and thereafter simultaneously subjecting the said carbonates to a reducing operation.

2. The method of preparing a cathode surface which comprises providing the same with a thin coating of alkaline earth metal carbonate thoroughly mixed with a small percentage of a carbonate of a metal of the group consisting of nickel and cobalt and thereafter simultaneously subjecting the said carbonates to a reducing operation.

3. The method of preparing a cathode surface which comprises preparing a mixture of finely divided alkaline earth metal carbonate with a small percentage of nickel carbonate, adding an organic binder, applying the mixture as a thin coating to the said cathode surface, and subjecting the same to a reducing atmosphere to reduce said carbonates simultaneously.

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