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FLUX FOR CADMIUM AND ITS ALLOYS AND METHOD FOR REGENERATING SAME

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10 Claims. (Cl. 148—26)

This invention relates to flux for cadmium and its alloys and to a method for regenerating said flux.

It is highly desirable in many commercial operations involving the use of cadmium or its alloys to conduct such operations in the presence of a flux and a variety of factors contribute to make the use of a flux necessary. For example, when no flux is employed the metal or alloy becomes coated with a dry powder comprising metallic oxides and metal dross which condition becomes pronounced above 400° C. and above which temperature metal losses by volatilization and burning are substantial. Further, an additional difficulty is encountered by reason of the toxicity of the cadmium fume evolved particularly at operating temperatures in excess of 500° C.

While the necessity for employing a flux has been clearly demonstrated in the past, nevertheless the fluxes heretofore employed have only partially solved the problem. For example, some of them are quite volatile; others react with the cadmium or cadmium alloy or with the products of oxidation of the metal or alloy to form sludges which foul the slag or flux; while still others are unsuited for particular purposes for sundry reasons.

The present invention provides a flux for cadmium and its alloys which overcomes the difficulties met with when no flux is used and which at the same time is free from such objectionable characteristics, as those heretofore mentioned that are exhibited by slags or fluxes of the type previously employed in the art. In addition, the invention provides a simple and efficient method for regenerating the flux so that it may be used indefinitely.

The flux of the invention, which has been found to give greatly improved results, comprises a mixture of cadmium chloride and/or bromide and one or more alkali salts selected from the chlorides and bromides of the three alkali metals, lithium, potassium and sodium. Such a flux is liquid at low temperatures, effectively seals a bath of the molten cadmium or cadmium alloy from the air, will not form a coating on articles dipped in the molten metal through a cover of the flux, and is capable of being used for long periods of time. In addition to these and other important advantages, it has further been found that such flux may be readily regenerated by additions of ammonium chloride and/or bromide which is probably effected according to the equation:

$$CdO+2NH_4Cl \rightarrow CdCl_2+2NH_3+H_2O$$

In fact the flux may be initially formed by adding ammonium chloride or bromide to a suitable alkali salt mixture on the surface of the bath, thus generating the necessary cadmium chloride in situ. These ammonium salts also tend to improve the cleaning efficiency and lower the melting point of the flux.

As a specific example to illustrate the invention, a flux comprising 58% cadmium chloride, 22% potassium chloride and 20% sodium chloride and which melted at approximately 354° C. was employed as a cover for a cadmium alloy bath used for coating articles by dipping. Articles introduced into the molten alloy through the flux remained perfectly clean thus allowing them to be readily wetted by the alloy. Ammonium chloride was added from time to time as were small quantities of the binary salt mixture comprising 52% potassium chloride and 48% sodium chloride and after twenty-four hours of continuous operation, the flux did not build up an insoluble sludge.

While the particular $CdCl_2$—KCl—NaCl mixture above mentioned is of interest and importance in that such mixture approaches the ternary eutectic point, other ratios may be used with excellent results. Also, it has been found that the bromides may be substituted for the chlorides with satisfactory results and ammonium bromide may be used in the regenerating process. A flux comprising a $CdBr_2$—KBr—NaBr mixture having a melting point of only 288° C. has given good results. Also lithium chloride or lithium bromide may be used either as a substitute for or in combination with the chlorides and/or bromides of potassium and sodium. In general, the choice of salts used will be dictated by their respective costs.

It will thus be appreciated that the present invention provides a flux and method for regenerating same which mark a distinct improvement in the art relating to cadmium and its alloys and that while certain specific disclosures have been for purposes of illustration it is possible that various omissions, substitutions and changes may be made without departing from the invention.

What is claimed is:

1. A stable flux of low melting point for cadmium and its alloys consisting of cadmium chloride and/or bromide and one or more alkali salts

selected from the group consisting of the chlorides and bromides of lithium, potassium and sodium.

2. The method for regenerating the flux set forth in claim 1 which comprises incorporating ammonium chloride and/or bromide therein.

3. A stable flux of low melting point for cadmium and its alloys consisting of cadmium chloride and one or more alkali salts selected from the group consisting of the chlorides of lithium, potassium and sodium.

4. The method for regenerating the flux set forth in claim 3 which comprises incorporating ammonium chloride therein.

5. A stable flux of low melting point for cadmium and its alloys consisting of cadmium bromide and one or more alkali salts selected from the group consisting of the bromides of lithium, potassium and sodium.

6. The method for regenerating the flux set forth in claim 5 which comprises incorporating ammonium bromide therein.

7. A flux for cadmium and its alloys consisting of a substantially eutectic mixture of cadmium and alkali metal halides of the group comprising chlorides and bromides.

8. A stable flux of low melting point for cadmium and its alloys comprising a cadmium halide, an ammonium halide and at least one alkali metal halide, the said halides being exclusive of fluorides and iodides.

9. A flux for cadmium and its alloys comprising approximately 58% cadmium chloride, 22% potassium chloride and 20% sodium chloride.

10. The method of preparing a flux for cadmium which comprises fusing one or more salts selected from the group consisting of the chlorides and bromides of lithium, potassium and sodium on a cadmium-containing bath and adding a corresponding ammonium salt in sufficient quantities to generate in situ in the flux the corresponding cadmium salt.

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