FLUX COMPOSITION FOR USE PRIOR TO GALVANIZING

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This invention relates to fluxes and, more particularly, to galvanizing flux compositions adapted to be used in a flux bath.

It is customary to prepare a metal article prior to introduction into a molten metal bath such, for example, as a bath of molten zinc by passing it through an aqueous solution called a "flux bath" or a "flux wash." The aqueous solution usually contains fluxing materials such as zinc chloride, ammonium chloride, and zinc ammonium chloride.

After the metal article has been passed through the flux bath it is dried to remove substantially all water and then immersed in molten metal to form a metal coating thereon. It is important that the applied coating of flux material be uniform and continuous on the surface of the metal article to be coated with the molten metal.

Any exposed areas on the surface of the metal articles, that is, areas devoid of flux material, are undesirable in that the subsequently applied molten zinc will not adhere well to these areas and in many instances will not adhere at all.

It is also important that the applied coating of flux material adhere well to the surface of the metal member to which it is applied. Often times handling of the metal article with the applied flux material prior to dipping it into the molten zinc will result in the unintentional removal of the flux material from the metal member leaving exposed areas. As above set forth, the subsequently applied molten zinc will not adhere satisfactorily to these exposed areas.

The object of this invention is to provide a novel flux composition which, when applied to a metal article from a solution thereof, will provide a uniform, continuous and adherent coating of the flux composition on the surface of the metal member, whereby a tight adherent and ductile coating of metal can be applied subsequently thereafter.

Another object of this invention is to provide a new flux composition comprising a fluxing material and an organic film forming material.

A further object of this invention is to provide a novel flux composition consisting essentially of a fluxing material selected from the group consisting of zinc chloride, ammonium chloride and zinc ammonium chloride and a cellulose derivative selected from the group consisting of carboxymethyl celluloses and salts thereof.

For a full and complete understanding of the nature and the objects of this invention, reference is made to the following detailed description.

In accordance with this invention, an improved galvanizing flux composition is prepared from ammonium chloride, zinc chloride, zinc ammonium chloride and other such flux compositions by the addition thereto of an organic film forming material, preferably of a water-soluble type.

Cellulose derivatives selected from the group consisting of carboxymethyl celluloses and salts thereof have proved highly satisfactory as the organic film forming material. The carboxymethyl celluloses that can be satisfactorily employed in this invention are carboxymethyl cellulose, sodium carboxymethyl cellulose, potassium carboxymethyl cellulose, sodium carboxymethyl cellulose, potassium carboxymethyl cellulose, sodium carboxymethyl cellulose, potassium carboxymethyl cellulose, and sodium carboxymethyl cellulose.

Of the above enumerated cellulose derivatives it is preferred to use sodium carboxymethyl cellulose since it is readily available commercially and is relatively inexpensive. Of the above enumerated fluxing materials it is preferred to employ zinc ammonium chloride. For the purpose of brevity, the preferred ingredients, sodium carboxymethyl cellulose and zinc ammonium chloride, will be referred to throughout the remainder of the specification. It is to be understood, however, that the invention is not limited thereto.

Other organic film forming materials that can be satisfactorily employed in carrying out this invention are other cellulose derivatives such as methyl cellulose, ethyl carboxymethyl cellulose and the like. Polyvinylalcohol has also proved satisfactory.

The flux composition of this invention can be prepared by thoroughly admixing the flux material, zinc ammonium chloride, with the film forming material, sodium carboxymethyl cellulose. The amount of sodium carboxymethyl cellulose employed in admixture with the zinc ammonium chloride is from about 0.1% to about 3%, by weight, based on the weight of the zinc ammonium chloride. A greater amount of sodium carboxymethyl cellulose can be employed if desired, the above range being the preferred range.

A flux bath can be prepared by adding the zinc ammonium chloride and sodium carboxymethyl cellulose mixture to water in sufficient amount to form an aqueous solution containing from about 1% to 50% by weight of zinc ammonium chloride. An alternate procedure is to first prepare the zinc ammonium chloride flux bath and then to add the sodium carboxymethyl cellulose in an amount equal to about 0.1% to about 3% by weight based on the weight of the zinc ammonium chloride.

In the preferred practice of this invention, the metal parts to be galvanized are immersed in an acid pickling bath containing from about 3% to 25% by weight of sulfuric acid dissolved in water. The pickling of the metal members is preferably effected at a temperature of from about 120° F. to about 180° F. Pickling is then transferred to a rinse bath containing water where the members are thoroughly rinsed.

The next step is to transfer the parts to a bath containing zinc coated to a flux bath which consists essentially of an aqueous solution of the novel flux composition of this invention. The flux bath is preferably heated to a temperature of from about 180° F. to about 200° F. so that when the parts emerge therefrom, there is enough heat in them to cause the air to dry almost instantaneously.

It is possible, however, to bake the parts or pass them through heating tunnels in order to effect the drying.

The resulting coating of the flux composition of this invention is a substantially uniform, continuous, and adherent coating. No parts of the metal member are exposed and the coating is not easily dislodged or removed in handling. The coating production is a thin dry adherent protective coating and the metal articles may be stored for long periods of time without any untoward effects. The coated metal members can be subjected to rough handling, and there is little or no danger of the coating being removed from the metal members whereby the base metal is exposed with the attendant untoward effects.
Example I

A steel sheet, 12 inches by 12 inches by 3/8 inch, is degreased by immersion in a suitable solvent and then immersed in an acid pickling bath containing about 20% by weight of 98% sulfuric acid dissolved in water. The temperature of a pickling bath is maintained at about 170°F. The steel sheet is immersed in the acid pickling bath for a period of time of about one minute and then removed and rinsed in clear, running water. The steel sheet is then transferred to a flux bath containing the flux composition of this invention. The flux bath is prepared by first adding and admixing 3 pounds of zinc ammonium chloride per gallon of water and adding thereto about .5 ounce per gallon of solution of sodium carboxymethyl cellulose. The temperature of the flux bath is maintained at a temperature of about 190°F. The steel sheet after immersion in the flux bath for a period of a few seconds is removed therefrom. The steel sheet dries almost instantly from removal from the bath.

The applied coating is tough, continuous, uniform, and highly adherent to the surface of the metal member.

The treated metal members are then passed into a molten zinc bath and a coating of zinc applied thereto. The zinc coated metal members are characterized by a zinc coating that is smooth, ductile, brilliant, and tightly adherent to the metal member.

Example II

The same procedure and the same ingredients, with the exception that 3 pounds of zinc chloride are substituted for the 3 pounds of zinc ammonium chloride, of Example I are employed to provide a zinc coating on a steel sheet. The applied zinc coating is ductile, brilliant, and highly adherent to the steel sheet.

Example III

The same procedure and the same ingredients, with the exception that 0.5 ounce per gallon of solution of carboxymethyl cellulose is employed instead of the sodium carboxymethyl cellulose, of Example I are employed to provide a coating of zinc on a steel sheet. The applied zinc coat is ductile and highly adherent to the steel sheet.

Polyvinyl alcohol, methyl cellulose, and ethyl cellulose are satisfactorily substituted for the sodium carboxymethyl cellulose of Example I. Also, the zinc ammonium chloride of Example I is satisfactorily replaced with ammonium chloride.

This invention is applicable to the galvanizing of ferrous metal products which are normally capable of being galvanized, including low carbon steels, high carbon steels, malleable iron forgings. Furthermore, the flux composition of this invention can be employed in other metal coating applications requiring a flux, such for example, as in tinning of metal members to provide tin plate thereon.

Since certain obvious changes may be made in the above procedure and different embodiments of the invention can be made without departing from the scope thereof, it is intended that all matter contained in the above description shall be taken as illustrative and not in a limiting sense.

We claim as our invention:

1. A flux bath for application to metals prior to galvanizing consisting essentially of an aqueous solution containing (A) a fluxing material selected from the group consisting of zinc chloride, ammonium chloride, and zinc ammonium chloride, and (B) a film-forming cellulose derivative selected from the group consisting of carboxyalkyl celluloses and salts thereof, said flux bath containing on a dry weight basis about 0.1% to 3% by weight, based on the weight of the fluxing material, of the cellulose derivative.

2. A flux bath for application to metals prior to galvanizing consisting essentially of an aqueous solution containing (A) a fluxing material selected from the group consisting of zinc chloride, ammonium chloride, and zinc ammonium chloride, and (B) film-forming sodium carboxymethyl cellulose, said flux bath containing on a dry weight basis about 0.1% to 3% by weight, based on the weight of the fluxing material, of the sodium carboxymethyl cellulose.

3. A method for protecting metallic material which comprises immersing said metallic material in a flux composition maintained at about 180°F to about 200°F, said flux composition consisting essentially of an aqueous solution containing (A) a fluxing material selected from the group consisting of zinc chloride, ammonium chloride, and zinc ammonium chloride, and (B) a film-forming cellulose derivative selected from the group consisting of carboxyalkyl celluloses and salts thereof, said aqueous solution containing about 0.1% to about 3% by weight, based on the weight of the fluxing material, of the cellulose derivative, thereafter removing the metallic material from said flux composition and drying the metallic material whereby there is formed on the surfaces of the metallic material a continuous protective film of said cellulose derivative containing said fluxing material in dry condition.

4. Metallic material having over its surfaces a continuous protective film consisting of a cellulose derivative selected from the group consisting of carboxyalkyl celluloses and salts thereof, said protective film containing a fluxing material selected from the group consisting of zinc chloride, ammonium chloride, and zinc ammonium chloride.

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