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CORROSION INHIBITING BUTADIENE STYRENE PAINT COMPOSITION

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ABSTRACT OF THE DISCLOSURE

Coating compositions, suitable for providing anti-corrosion coatings on metal surfaces and particularly for application to rusty and weathered surfaces comprising a water based latex metal primer containing an additive mixture of di-basic ammonium citrate and a neutralized acidic phosphate co-ester of an aliphatic alcohol and a non-ionic adduct of ethylene oxide and an organic compound containing reactive hydrogen atoms.

This invention relates to improved coating compositions such as metal primers whose protective qualities render them highly satisfactory for impeding and delaying the corrosion of metal surfaces and particularly useful in the recoating of rusted metal surfaces without requiring extensive treatment of the rusted surface.

In the maintenance of metal structures exposed to the elements, the development of rust is a serious problem of long standing. Structures such as bridges, ship superstructures, storage tanks, chemical and refinery plant structures, etc., have generally been protected by painting and the protective coating must be renewed periodically. Usually, such metal structures, when first erected, are primed and top-coated. After a period of exposure to the elements, the coating weathers away and in areas where the coating is inadequate, rust forms.

Initial primers and primers used for recoating are formulated to give maximum protection of the metal base against rusting. Generally, the available primers are more satisfactory for painting previously unpainted surfaces than they are recoating surfaces mainly because the unpainted metal is fairly smooth and free of rusty scale. Even those primers specially formulated as recoating primers are known to fail first in areas where such scaly, badly rusted areas are recoated. Often it is the practice to scrape off, sand blast, or otherwise remove as much rust as possible before recoating. Recoating of surfaces from which rust has been removed usually gives satisfactory protection against further rusting. It is impractical, however, to remove all rust from large structures because of prohibitive costs. Accordingly, the structure may be recoated with some rust still remaining. In such cases, primer/top-coat systems which will still afford good protection are required, but currently, the industry acknowledges that present primers with few exceptions are lacking with respect to their adherence to rusted areas. In all of the rust inhibitive aqueous priming systems which are commercially available and which the inventor is personally familiar, the rust tends to bleed or migrate to the surface of the primer whenever the rust has not been completely removed. However, with the composition of the present invention, no bleeding or migration of the rust to the surface is evident with a coating in the order of 1.5 mils dry film thickness.

Accordingly, in the usual practice it is necessary not only to remove all loose deposits from the surface to be recoated, but also to abrade the surface to remove mechanically the scale and the more firmly adhering rust or other metal oxides.

Thus, it is a principal object of this invention to eliminate these prior art shortcomings, and, in accordance with this invention, it is possible to apply directly to rusted metal surfaces a primer coating having good bonding and adhesion characteristics; the only preliminary treatment of the surface being the removal of scale.

In accordance with this invention, it has now been discovered that water base latex coating compositions having the ability to protect metal surfaces against rusting and in particular the ability to coat badly rusted metallic surfaces without extensive prior treatment of said rusted areas may be prepared by the inclusion in the coating composition of a new and novel mixture of di-basic ammonium citrate and the potassium salt of a phosphate co-ester of aliphatic alcohol and a non-ionic adduct of ethylene oxide and organic compounds containing reactive hydrogen atoms. The acidic phosphate co-esters and their neutralized derivates are more fully described in U.S. Pat. 3,380,927, issued Apr. 30, 1968, and the disclosure of this patent is herein incorporated by reference. More specifically, the acidic phosphate co-esters are solubilized in polar media such as water by neutralization with inorganic alkalis such as alkali metal hydroxides.

A preferred additive mixture for use in conferring desired properties to the latex coating compositions of this invention is obtained by mixing di-basic ammonium citrate with the potassium salt of a commercially available phosphate co-ester, i.e. the potassium salt of a complex organic polyphosphoric ester acid known as Strodex PK–90, manufactured by Dexter Chemical Corporation, Bronx, N.Y. The method of preparing this phosphate co-ester is taught in the aforementioned Pat. 3,380,927.

In the preparation of the additive mixture, the neutralized phosphate co-esters and di-basic ammonium citrate are preferably mixed in equal proportions. However, the proportions of one component to the other may be varied and effective results have been obtained by using either in a ratio ranging from about 0.2:1 to 1:1.

In formulating the coating compositions of this invention, the combined weight of the additives may comprise from 0.5 to 5% by weight of the composition.

In the experimentation leading to the novel additive mixture and coating composition of this invention, Strodex PK–90, described above, and di-basic ammonium citrate were used separately in various water base latex compositions. Neither material by itself was effective in providing a satisfactory coating for rusted surfaces. The combined effect of the two components herein described, accordingly, is considered to be synergistic in nature.

It is generally known that most primers now in use exhibit a tendency to merely cover the surface of a rusty area on ferrous and other metals without penetrating deeply thereinto. As a result, much porosity remains in the rust layers. This porosity is very undesirable since rusting usually continues under the film. After a period of exposure to the elements, the coating film over the rust areas becomes blistered and then flashes off. It has now been found that the additive mixture hereinabove described, when incorporated in a primer coating, for example markedly improves the wetting and penetrating properties of the coating, while conferring other advantages such as improved flexibilization of the resulting film and improved durability on exposure.

The following examples illustrate the merits of the additives of this invention in coatings for providing protective coating systems on clean (non-pre-rusted) and pre-rusted ferrous metal. While these examples illustrate the best modes presently known for applying and practicing the principles of this invention they are not intended to limit this invention in any sense.

EXAMPLE I

A water based latex primer, typical of the compositions coming within the scope of this invention was prepared by mixing the following components:

	Lbs.
Water	168
2% hydroxyethylcellulose solution	150
Strodex PK–90	3
28% ammonium hydroxide	4
Dibasic ammonium citrate	5
Basic silicate white lead (80% PbO type)	100
Zinc oxide	50
Titanium dioxide	100
Barium sulfate	200
Amorphous silica	50
Water soluble melamine [1]	12
30% phenyl mercuric acetate	0–5
Cobalt drier	4
Butadiene-styrene copolymer [2]	375

[1] Cymel 301—Product of American Cyanamid Co.
[2] Pliolite 491—Product of Goodrich Chemical Co.

In the formulation of the foregoing composition, the Strodex PK–90 and the di-basic ammonium citrate were pre-mixed and then added to the latex composition.

Two steel panels, one clean (non-rusty) and one rusty, were coated with the foregoing formulation. Tests for salt spray resistance clearly showed that after one week there was no evidence of failure, that is, rusting on either panel.

EXAMPLE II

A second formulation was prepared, using equivalent proportions of the same components, but omitting the Strodex PK–90 and the di-basic ammonium citrate. Two steel panels, one clean (non-rusty) and one rusty, were coated with this formulation. Tests for salt spray resistance clearly showed rust formation on both panels after twenty-four hours.

Similar tests were run with the formulation of Example II to which were added in one case, di-basic ammonium citrate and in another case, Strodex PK–90. Panels, rusted and unrusted, as in the foregoing examples, were coated with these formulations and tested for salt spray resistance. At the end of twenty-four hours, all panels coated with these formulations showed rusted areas.

It is obvious that in the preparation of the novel compositions of this invention that modifications in formulations and variations in concentrations may be made, as required. Obviously, these changes will be dependent on the type of coating desired. It will be understood that it

is intended to cover all changes and modifications of the preferred embodiment of this invention, herein chosen for the purpose of illustration, which do not constitute departures from the spirit and scope of the invention.

What is claimed is:

1. A corrosion inhibiting butadiene-styrene elastomeric paint composition consisting essentially of a butadiene-styrene latex, di-basic ammonium citrate and the potassium salt of a co-ester of (1) a phosphorous compound selected from the group consisting of phosphorous pentoxide, orthophosphoric acid and polyphosphoric acid, (2) an aliphatic monohydric alcohol containing from 6 to 16 carbon atoms, and (3) a nonionic adduct of ethylene oxide and an organic compound selected from the group consisting of alkylated phenols containing at least one alkyl group of 6 to 18 carbon atoms, aliphatic alcohols containing from 6 to 25 carbon atoms, aliphatic monocarboxylic acids containing from 6 to 20 carbon atoms, aliphatic amines containing 6 to 20 carbon atoms, and aliphatic mercaptans containing 6 to 20 carbon atoms, said nonionic adduct (3) containing from 1 to 40 mols of ethylene oxide per mol of said organic compound, and being present in the weight proportions of about 5 to 85 parts per 100 parts combined of said nonionic adduct (3) and said aliphatic monohydric alcohol (2), and the molar ratio of the total number of mols combined of said aliphatic monohydric alcohol (2) and of said nonionic adduct (3) to the total number of mols of said phosphorous compound (1), calculated as phosphorous pentoxide, being within the range from about 1:1 to about 5:1.

2. The composition of claim **1**, wherein either component may be present in a ratio of 0.2:1 to 1:1.

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