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“IMPROVEMENTS IN OR RELATING TO RUST PREVENTING COMPOSITIONS”

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, RAFI MARG, NEW DELHI-1, INDIA,  
AN INDIAN REGISTERED BODY INCORPORATED UNDER THE REGISTRATION OF SOCIETIES  
ACT (ACT XXI OF 1860).

This is an invention by KUMMATTITHIDAL SANTHANAM RAJAGOPALAN, Scientist, and CHAKRAVARTHI  
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**PROVISIONAL**

*The following Specification describes the nature of this invention.*

This invention relates to improvements in or relating to  
Rust Preventing Compositions.

It is agreed by most Corrosion Engineers that after removing rust and scale, it is necessary to prevent re-rusting and also provide a satisfactory base for subsequent painting and erected steel structures. Rust and scale removing jellies or solutions which are usually based on acidic constituents, can cause re-rusting of steel structures immediately after removing rust and scale. A method of preventing re-rusting which also provides a satisfactory base for painting is needed. It is found to be convenient to use a paste for this purpose.

The characteristics of the paste are (1) it does not run off surface on application. (2) The active substance remains in contact with the metal surface for the period required (3) the paste can be washed off the surface with water. To get the above characteristics, one or more substances which cause passivation and one or more thickening agents or carriers which retain the active substances are mixed together with or without a wetting agent. The paste thus obtained is brushed on the surface of the derusted structure, washed off, after an hour. The use of an aqueous solutions for this

purpose is open to the objection that it will not stay on the surface on which it is applied long enough to keep the surface active, and the surface becomes dry soon after its application under temperature conditions normally obtained in this country.

The object of the present invention is to formulate a paste for preventing re-rusting, which can be made from indigenously available materials and which are available in plenty.

The paste developed by us is based on cheaply available materials such as plant carbohydrate and plant proteins, glue, alkali phosphate and nitrite which are available in large quantities in this country together with a very small amount of a commonly used fungicide. This paste is found to satisfy the following requirements :—

- 1) The materials employed are abundantly available in this country.
- 2) They are reasonably low cost, and
- 3) Satisfactory performance as defined under characteristics.

The formulations of the paste prepared by us are illustrated below:—

**A Typical Formulations of the Paste**

Type of Plant Carbo-hydrate	Quantity of plant carbo-hydrate & plant protein	Quantity of Glue (gms)	Quantity of phosphate solution	Quantity of nitrite solution.	Total cost	Area covered
a)	40 grams	20	100 c.c.	100 c.c.	6.15P 7P. (approx.,)	50 sq. dm.

Examples of plant carbohydrate and plant protein that can be used are : starch, root flour, ground nut flour.  
The concentration ranges for phosphate and nitrite solutions are as follows:—

Phosphate solution	—	1-5%
nitrite solution	—	1-5%

The performance of the paste developed by us is shown below in comparison with a well-known and very effective rust preventive, namely metal phosphate solutions :—

**Performance of Paste**

Description of test	Nitrite-phosphate solution	Paste
(a) Test for prevention of re-rusting (De-rusted steel brushed with phosphate solution, left for 1 hour and washed in flowing water)	Re-rusted	not rusted
(b) Presence of paste on metal surface: (Derusted steel brushed and left for 1 hour and examined the surface).	Dries away.	Remaining intact on the surface.

Price : TWO RUPEES.

**Noteworthy features**

1. The paste developed by us can be prepared entirely from the indigenously available materials.
2. The materials employed in making the paste are cheaper than those employed for pastes reported in literature.
3. That paste developed by us can bring about efficient prevention of re-rusting when brushed on de-rusted steel structures.
4. By treatment with the paste, the steel surface develops a thin phosphate film which is a satisfactory base for painting.

**COMPLETE**

*The following Specification particularly describes and ascertains the nature of this invention and the manner in which it is to be performed.*

This invention relates to improvements in or relating to Rust Preventing Compositions.

It is well-known that the life of paint on steel is very much reduced if the steel surface is covered with scale or rust at the time of painting. The methods of removal of rust and scale e.g., shot blasting, acid pickling, flame cleaning etc., leave behind a surface which is prone to rusting. To prevent re-rusting before painting as well as provide a key between iron or steel and paint, phosphate treatment, phosphoric acid washes, tannate washes and etch primers have been developed. Phosphating is carried out by immersion in or spraying with hot solutions of phosphoric acid and metal phosphate. Phosphoric acid washes and most of the tannate washes which are applied by brushing, swabbing or spraying are not considered equivalent to phosphating as these do not provide a good base for subsequent painting. Each primers which were developed from phosphoric washes leave behind an organic film which form a good key for nearly all paints.

Phosphating process can only be applied by immersion or spraying for which shop facilities are required and these are not applicable to erected steel structures out-doors. Though etch primers can be applied by brushing, they suffer from the following drawbacks :—

- a) they are generally two pack systems,
- b) some of the constituents employed in etch primers e.g., poly vinylbutyrol have to be imported and
- c) the cost of treatment is high.

Phosphoric acid and tannate washes produce thin films and do not offer as much protection as phosphate coating and are likely to run off the surface when applied to out-door structures.

The main object of this invention is to formulate a paste or jelly which can be applied to out-door steel structures after removal of rust and scale so that re-usting does not take place and a satisfactory base for painting is produced.

**Main finding:**

The paste or jelly produces adherent phosphate coating, prevents re-rusting and forms a good base for painting.

**The new results:**

Outdoor steel structures and fabricated articles can be given a phosphate coating by brush application.

**A statement of invention:**

According to the present invention the composition for producing an adherent phosphate coating on application by fibre brush at room temperature and which prevents rerusting of descaled and derusted steel surface comprises a plant product such as root flour, maize flour or ground-nut flour, a metal phosphate, a metal nitrate or nitrite, a fungicide and a mineral acid.

The plant product is used to an extent of 20-30%; metal phosphate to an extent of 2-10%; metal nitrate or nitrite to an extent of 1-15%, and fungicide to an extent of 0.5-2%.

In a typical composition the plant product is root flour, maize flour or ground-nut flour, the metal phosphate is tri-sodium phosphate, or disodium phosphate, the metal nitrate is manganese nitrate the metal nitrite is sodium nitrite the mineral acid is nitric acid or phosphoric acid and the fungicide is p-nitrophenol, o-nitrophenol or  $\beta$ -naphthol.

The invention includes within its scope a process for the production of rust preventing composition which consists in mixing two solutions containing metal nitrate and mineral acid respectively and heating the mixed solution with plant product and adding fungicide after thorough mixing.

The following process steps are applied :-

- 1) a solution containing the metal nitrate and mineral acid is prepared (I);
- 2) a solution containing the metal phosphate and mineral acid is prepared (II);
- 3) I & II are mixed and boiled;
- 4) plant product is added to I & II while at boiling temperature and thoroughly mixed;
- 5) fungicide added to the mix, and
- 6) the rust preventing composition is cooled and filled in container.

Thus, a paste has been formulated using a cheaply available material such as plant carbohydrate and plant protein, phosphoric acid, alkali phosphate, manganese nitrate and a fungicide which when applied by brush to descaled/derusted steel surface prevents re-rusting and produces a phosphate coating on a steel surface at room temperature.

The concentration ranges and the ingredients used in the formulations are given below :-

plant carbohydrate and protein	—	e.g., root flour and ground-nut flour 20-30% (not fit for human consumption)
manganese nitrate	—	5 to 15%
phosphoric acid or chloride phosphate + nitric acid	—	2-5%
sodium phosphate	—	1-5%
sodium nitrite	—	1-5%
water	—	Balance

**Examples :****Example 1****Solution 1**

5 grams of disodium hydrogen phosphate is dissolved in 100 c.c. of distilled water and the pH is adjusted to 4.5 by adding phosphoric acid (30 drops).

**Solution 2**

1 gram of sodium nitrite is dissolved separately in 100 c.c. of distilled water. 50 c.c. of solution 1 and 50 c.c. of solution 2 are mixed heated to boiling and 20 grams of root flour is added and mixed till a paste is obtained. After cooling this paste is applied to a steel surface in which rust and scale has been removed by using a fibre brush. After 20 minutes, the paste is washed off with running water and dried. Now the surface carries a phosphate coating of 50-150 mgms/sq.ft., and is ready for painting.

**Example 2**

26 c.cs of manganese nitrate solution and 10 c.cs of nitric acid are mixed (I). Then 19 grams of tri-sodium phosphate is added to water containing 18 c.cs of nitric acid (II) (I) & (II) are mixed and boiled and sodium hydroxide is added and the pH of the solution is adjusted to 2. The total volume of the solution is made up to 300 c.cs. 50 c.c. of the above solution is boiled and 9 grams of root flour added and

stirred till a paste is obtained. This paste is applied to a steel surface from which rust and scale has been removed. After 20 minutes, the paste is washed off with running water and dried. Now, the surface carries a phosphate coating of 500-750 mgms/sq.ft. and is ready for painting.

Performance of the paste :

Description of test	untreated (pickled)	treated (with paste)
1) 24 hours exposure to salt fog	rusted	not rusted
2) 100% humidity	rusted	not rusted
3) Atmospheric exposure	rusted	not rusted

Main advantages:

- 1) The rust preventing compositions can be prepared from indigenously available chemicals.
- 2) Rust preventing composition can be applied at room temperature.
- 3) The rust preventing composition can be applied by brush with a fibre brush and it is convenient to apply on out-door structures.
- 4) The rust preventing composition prevents re-rusting and also forms a phosphate coating on steel surface.

A paste has been formulated using a cheaply available material such as plant carbohydrate and plant protein, phosphoric acid, alkali phosphate, manganese nitrate and a fungicide which when applied by brush to descaled and derusted steel surface prevents re-rusting and produces a phosphate coating on a steel surface at room temperature.

We claim:

1. A composition for producing an adherent phosphate coating on application by fibre brush at room temperature and which prevents rerusting of descaled and derusted steel surface which comprises a plant product such as root flour, maize flour or ground-nut flour, a metal phosphate, a metal nitrate or nitrite, a fungicide and a mineral acid.
2. A composition as claimed in claim 1 wherein the plant product is used to an extent of 20-30%; metal phos-

phate to an extent of 2-10%; metal nitrate or nitrite to an extent of 1-15%, and fungicide to an extent of 0.5-2%.

3. A composition as claimed in claim 1 or 2 wherein the plant product is root flour, maize flour or ground-nut flour, the metal phosphate is trisodium phosphate or disodium phosphate, the metal nitrate is manganese nitrate, the metal nitrite is sodium nitrite, the mineral acid is nitric acid or phosphoric acid and the fungicide is p-nitrophenol, o-nitrophenol or  $\beta$ -naphthol.
4. A rust preventing composition substantially as herein before described.
5. A process for the production of a rust preventing composition as claimed in any of the preceding claims which consists in mixing two solutions containing metal nitrate and mineral acid respectively and heating the mixed solution with plant product and adding fungicide after thorough mixing.
6. A process as claimed in claim 5 wherein the following process steps are applied :
  - 1) a solution containing the metal nitrate and mineral acid is prepared (I);
  - 2) a solution containing the metal phosphate and mineral acid is prepared (II);
  - 3) I & II are mixed and boiled;
  - 4) plant product is added to I & II while at boiling temperature and thoroughly mixed;
  - 5) fungicide added to the mix, and
  - 6) the rust preventing composition is cooled and filled in container.
7. A process for the preparation of a rust preventing composition substantially as hereinbefore described.

Dated this 11th day of December 1967.

Sd.

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Patents Officer