

UNITED STATES PATENT OFFICE

2,336,071

TREATMENT OF METALS

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No Drawing. Application December 13, 1941, Se-
rial No. 422,873. In Great Britain February 4,
1938

9 Claims. (Cl. 148—6)

This invention relates to the treatment of metals, especially iron or steel, for instance to the treatment of metals with phosphate coating solutions in order to improve the resistance of the metals to corrosion or to provide a corrosion-resisting base for paints. This application is a continuation in part of application, Serial No. 254,238, filed February 2, 1931, issued September 15, 1942, as Patent No. 2,295,545.

It is an object of the invention to accelerate the action of reagents which attack a metal surface.

It is a further object of the invention to accelerate the action of phosphate coating solutions such as zinc, manganese and the like, i. e. to reduce the time taken by the coating solution to form a complete coating, or to reduce the temperature, or to obtain a better coating in a given time under given conditions than if the compound were not present.

Where phosphate and similar coatings are being employed, they may be applied to the metal in any suitable manner, for instance by spraying, brushing, flowing or immersion methods.

It has now been found that the action of reagents which attack metal surfaces, and especially phosphate coating solutions, are improved by incorporating therein the nitroso group.

As illustrative of the compounds which may be employed to provide the nitroso group we have p-nitrosophenol, p-nitrosodimethylaniline, nitroso-n-methylurethane and the like.

The optimum concentration of the compound to provide the accelerating group in the reagent attacking the metal surface differs with different compounds but in the case of phosphate coating solutions is in general from about .01% to .4% by weight of the solution. The proper amount of accelerator for best results may be easily determined in any case by starting the solution off with a small amount of the accelerator and increasing the amount added to the phosphate coating solution until the desired acceleration is obtained.

The optimum concentrations, under the conditions used, of various compounds which may be employed according to the invention are given in the following table, the results being arrived at by adding the compound to a solution of zinc dihydrogen phosphate having a normality of N/20 free acid (determined by titrating with the aid of methyl orange indicator) and N/5 total acid (determined by titrating with the aid of phenolphthalein indicator) and treating a cleaned steel sheet for two minutes at 80° C.

The cleaned steel sheet referred to here and in the examples given below is a steel sheet in its original bright rolled condition rendered substantially free from grease by wiping with clean white spirit.

Substance	Optimum concentration
	Per cent
Nitroso-N-methylurethane.....	0.2
p-Nitroso-dimethylaniline.....	.04
p-Nitrosophenol.....	.4

While the compounds of the invention may be the only accelerators present in the coating bath, they may also be employed in conjunction with other accelerators, and with other acid phosphate coating solutions, for instance, metallic accelerators such as copper compounds, or oxidizing agents such as nitrates or nitrites. The presence of copper ions appears to promote heavier and darker coatings and the presence of a nitrate, such as zinc nitrate, appears to give a slight further acceleration.

If 0.001% of copper (calculated as the metal) is added to the solution, for instance in the form of the nitrate or carbonate, a darker and slightly heavier coating is obtained, and the addition of zinc nitrate results in a slight further acceleration.

While the invention has been illustrated by the treatment of steel, it is also useful in the coating of other metallic surfaces, such as surfaces containing zinc and alloys thereof.

What we claim is:

1. A composition comprising an acid phosphate coating solution containing an organic compound which contains the nitroso group, said compound being dissolved in the solution in an amount that accelerates the coating action of the solution.

2. A composition of matter comprising a zinc dihydrogen phosphate coating solution containing an organic compound containing the nitroso group, said compound being dissolved in the solution in an amount that accelerates the coating action of the solution.

3. A composition of matter comprising a manganese dihydrogen phosphate coating solution containing an organic compound containing the nitroso group, said compound being dissolved in the solution in an amount that accelerates the coating action of the solution.

4. The process which comprises treating one of the group consisting of ferrous and zinciferous surfaces with a phosphate coating solution con-

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aining an organic compound which itself contains a nitroso group, said compound being dissolved in the solution in an amount that accelerates the coating action of the solution until there is obtained upon the metallic surface a visible, protective phosphate coating.

5. The process which comprises treating one of the group consisting of ferrous and zinciferous surfaces with a phosphate coating solution containing zinc and an organic compound having the nitroso group, said compound being dissolved in the solution in an amount that accelerates the coating action of the solution until there is obtained upon the metallic surface a visible, protective phosphate coating.

6. The process which comprises treating one of the group consisting of ferrous and zinciferous surfaces with a phosphate coating solution containing manganese and an organic compound having the nitroso group, said compound being dissolved in the solution in an amount that accelerates the coating action of the solution until there is obtained upon the metallic surface a visible, protective phosphate coating.

7. The process which comprises treating a surface of one of the group consisting of ferrous and zinciferous surfaces with a phosphate coat-

ing solution containing nitroso-N-methylurethane, said nitroso-N-methylurethane being dissolved in the solution in an amount that accelerates the coating action of the solution, until a visible, protective phosphate coating is obtained upon the metallic surface.

8. The process which comprises treating a surface of one of the group consisting of ferrous and zinciferous surfaces with a phosphate coating solution containing p-nitroso-dimethylaniline, said p-nitroso-dimethylaniline being dissolved in the solution in an amount that accelerates the coating action of the solution, until a visible, protective phosphate coating is obtained upon the metallic surface.

9. The process which comprises treating a surface of one of the group consisting of ferrous and zinciferous surfaces with a phosphate coating solution containing p-nitroso-phenol, said p-nitroso-phenol being dissolved in the solution in an amount that accelerates the coating action of the solution, until a visible protective phosphate coating is obtained upon the metallic surface.

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