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CORROSION INHIBITOR

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6 Claims. (Cl. 148—8.1)

The present invention relates to the prevention of corrosion of metals such as iron and steel by acids and is particularly concerned with the avoidance of corrosion of these substances in acid pickling baths and in the form of metal containers in which acid is stored.

It has been known for some time that thiourea and its alkyl and aryl derivatives, such as ditolyl thiourea possess the property of preventing corrosion of iron articles to a remarkable extent when these compounds are incorporated in small amounts in acids which tend to attack such articles. The present invention rests upon the discovery that the corrosion inhibiting properties of these compounds are greatly enhanced by the admixture therewith of a substantial proportion of an alkyl nitrosamine, the lower members of the series of dialkyl nitrosamines having been found to be unusually effective for this purpose. By use of a properly proportioned mixture of ditolyl thiourea in conjunction with dimethyl nitrosamine, for example, it is possible to minimize corrosion of this type to a very remarkable extent.

While it is a well-known fact that compounds of the thiourea type inhibit corrosion of metals by acid, and we have found that nitrosamines likewise inhibit corrosion of this character, the effect of the addition of a thiourea in conjunction with a nitrosamine to an acid for the purpose of reducing its corrosive effects has been found to be very much greater than would be expected from a consideration of the inhibiting properties of the individual compounds. Although the advantages of the invention are obtained throughout a wide range of relative proportions of these inhibiting compounds, the best results have been attained in cases in which at least as much nitrosamine as thiourea is present.

The following examples illustrate the practice of the invention:

I

(*a*) A steel test strip having an area of 680 square millimeters was immersed in 6% sulphuric acid in the absence of any inhibitor for a period of 4½ hours at a temperature of approximately 80° C. At the conclusion of this period the strip had lost 91.8% of its original weight.

(*b*) Tests with similar strips immersed in similar acid solutions containing varying proportions of dimethyl nitrosamine indicated that this compound, when used alone, has very little inhibiting effect.

(*c*) A similar strip was immersed in a similar acid bath containing 1% di-ortho tolyl thiourea under conditions similar to those discussed at (*a*) above. The strip lost 0.06% of its original weight in this test.

(*d*) A similar strip was immersed in a similar acid bath containing 1% di-ortho tolyl thiourea and 1% dimethyl nitrosamine, under conditions similar to those discussed at (*a*) and (*c*) above. The strip lost 0.005% of its original weight in this test, indicating that the addition of the nitrosamine to the thiourea decreased the amount of corrosion by more than 90%.

II

(*e*) A steel test strip having an area of 680 square millimeters was immersed in 1:4 hydrochloric acid in the absence of any inhibitor for a period of 47 hours at a temperature of 25° C. At the conclusion of this period the strip had lost 7.9% of its original weight.

(*f*) Tests with similar strips immersed in similar acid solutions containing varying proportions of dimethyl nitrosamine indicated that this compound, when used alone, has very little inhibiting effect.

(*g*) A similar strip was immersed in an acid bath similar to those discussed at (*e*) and (*f*) containing 1% di-ortho tolyl thiourea, other conditions being the same as those discussed at (*e*). The strip lost 0.21% of its original weight in this test.

(*h*) A similar strip was immersed in an acid bath similar to those discussed at (*e*), (*f*) and (*g*) containing 0.5% di-ortho tolyl thiourea and 0.5% dimethyl nitrosamine, other conditions being similar to those discussed at (*e*) and (*g*). The strip lost 0.058% of its original weight.

III

Tests with other nitrosamines in conjunction with other derivatives of thiourea indicated that while optimum results appear to be obtained by the use of di-ortho tolyl thiourea and dimethyl nitrosamine, the advantages of the invention may be at least in part obtained by the substitution of other compounds from these two groups for the specific compounds of the above illustrative examples. Diamyl nitrosamine, for example, has been found to be effective in conjunction with compounds of the thiourea group and diamyl phenyl thiourea is effective in conjunction with the nitrosamines.

We claim:

1. A process for reducing the corrosion of metals by an acid in contact therewith which

comprises adding to such acid a derivative of thiourea chosen from the class consisting of thiourea and substituted thioureas and an alkyl nitrosamine.

2. A process for reducing the corrosion of metals by an acid in contact therewith which comprises adding to such acid ditolyl thiourea and an alkyl nitrosamine.

3. A process for reducing the corrosion of metals by an acid in contact therewith which comprises adding to such acid ditolyl thiourea and a dialkyl nitrosamine.

4. A process for reducing the corrosion of metals by an acid in contact therewith which comprises adding to such acid a derivative of thiourea chosen from the class consisting of thiourea and substituted thioureas and a dialkyl nitrosamine.

5. A process for reducing the corrosion of metals by an acid in contact therewith which comprises adding to such acid ditolyl thiourea and dimethyl nitrosamine.

6. A process for reducing the corrosion of metals by an acid in contact therewith which comprises adding to such acid a derivative of thiourea chosen from the class consisting of thiourea and substituted thioureas and dimethyl nitrosamine.

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