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PYRYLIUM SALTS AS PICKLING INHIBITORS  
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U.S. Cl. 252-79.4 3 Claims

This invention relates to pyrylium salts as picking inhibitors for iron and steel. The invention also pertains to pickling compositions containing the aforesaid pyrylium salts.

In the pickling art various materials, commonly organic compounds, are dispersed in the acid cleaning solution in order to retard corrosion of the underlying metal while at the same time not materially affecting the rate of attack on the scale. Inhibitors used in sulfuric acid pickling baths reduce metal attack substantially but not completely thereby permitting sufficient hydrogen evolution to effect dislodging of the scale and rust from the surface. In hydrochloric acid pickling and in all acid cleaning applications for that matter maximum inhibition of metal dissolution commensurate with reasonably effective scale removal is always a desideratum.

The theory generally advanced to explain the action of pickling inhibitors supposes formation of an adsorbed or chemisorbed layer on the newly bared metal surfaces thereby preventing attack by the acid bath.

With a view to obtaining improvements in pickling inhibitors we have discovered that certain pyrylium salts are particularly effective in this capacity and the provision of such materials and their use as pickling agents constitutes the principal objects and purposes of the invention. Other objects and purposes will become apparent subsequently.

Pyrylium salts are known chemical entities the description and preparation of which are set forth in the chemical and technical literature. An especially detailed account on their synthesis can be found in U.S. Patent 3,250,615.

In practicing the invention we have achieved excellent corrosion inhibition when using triarylpyrylium salts wherein the structure admits of a planar configuration. Accordingly the triarylpyrylium salt should be free of large or bulky groups which might prevent the molecule from assuming a planar arrangement. It is our opinion that such substituents hinder adsorption of the inhibitor to the freshly exposed metal surface.

Triphenylpyrylium tetrachloroferrate is an example of a preferred arylpyrylium salt. It can be obtained by the reaction of benzaldehyde with acetophenone using an acidic condensing agent. For details of the preparation reference is made to the aforesaid U.S. patent.

The 2,4,6-triphenylpyrylium tetrachloroferrate is unusual in that it provides practical inhibition at remarkably low concentrations. In fact it affords excellent protection when formulated in a pickling bath at concentra-

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tions as low as 0.02% by weight or less. The practical range for the additive is from about 0.01% to about 0.02%. It is effective in both sulfuric and hydrochloric acid, the two most commonly used pickling bath acids.

In using the 2,4,6-triphenylpyrylium tetrachloroferrate it is conveniently employed in the form of a concentrate formulation containing from about 10 to 20% of the inhibitor, about 20% of a detergent such as an alkylphenol-polyether-alcohol, about 1 to 2% of concentrated hydrochloric acid and about 69 to 58% water. A typical formulation is as follows in which the components are on a weight percent basis:

	Percent
2,4,6-triphenylpyrylium tetrachloroferrate	10
Nonylphenol-polyether-alcohol	20
Concentrated hydrochloric acid (37%)	1
Water	69

Addition of one part of the concentrate to 1,000 parts of the pickling bath provides a suitable concentration for pickling inhibition.

The detergents used in pickling baths are not particularly critical and any number of types and kinds can be used. Preferred species are the alkylaryl-polyether-alcohols although sodium alkylarylsulfonates also perform reasonably satisfactorily.

Pickling baths containing one part of the aforescribed concentrate to 1,000 parts by weight of the pickling bath showed 80.6% inhibition of acid attack on iron in 30% HCl at 40° C. and 85.6% in 20% sulfuric acid at 60° C.

What is claimed is:

1. A pickling bath composition suitable for use with iron and steel consisting essentially of an aqueous solution of acid selected from the class consisting of sulfuric and hydrochloric and as a pickling inhibitor 2,4,6-triphenylpyrylium tetrachloroferrate in the concentration of 0.01% about 0.02% by weight.

2. A method of inhibiting acid attack in steel and iron pickling baths which comprises exposing the fresh metal surface to the composition of claim 1.

3. An inhibitor concentrate formulation consisting essentially of 2,4,6-triphenylpyrylium tetrachloroferrate of the following ingredients by weight:

	Percent
2,4,6-triphenylpyrylium tetrachloroferrate	10-20
Nonylphenol-polyether-alcohol	20-20
Concentrated hydrochloric acid (37%)	1-2
Water	69-58

References Cited

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3,250,615 5/1966 Van Allan et al. --- 96-88 XR

MAYER WEINBLATT, Primary Examiner.

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