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OCTADECYLAMINE MATERIALS AND PROCESS

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The present invention relates to octadecylamine materials for water treating and processes of feeding octadecylamine materials to water. The invention is believed to find its widest application in corrosion inhibitors to protect water systems against corrosion.

When reference is made herein to water or water systems it is intended to designate any of a wide variety of systems in which water is used commercially or industrially, including cooling water systems, steam boiler systems, steam return condensate systems, steam distribution systems, heat transfer water systems, evaporator systems, processing water systems, wet pipe fire systems and the like.

In U. S. Patent No. 2,460,259 of H. L. Kahler, a method of inhibiting corrosion is described which uses high molecular weight amines, amine salts and amine oxides. Extensive use commercially has been made of octadecylamine ($C_{18}H_{37}NH_2$) and octadecylamine acetate ($C_{18}H_{37}NH_2 \cdot CH_3 \cdot COOH$) in carrying out this process.

Considerable difficulties have been encountered in the application of octadecylamine materials due to the inherently troublesome character of the materials themselves from the standpoint of feeding into water at remote locations.

The common practice in using these amine and amine salts to control carbon dioxide corrosion in steam and return condensate systems and the like is to disperse the amine or amine acetate in water in a chemical solution tank to produce a dispersion having a concentration of approximately 0.5 to 1.0 percent of amine or amine salt by weight. This dispersion is continuously fed as by a metering pump into the steam or condensate line.

There are special problems with both octadecylamine and also with octadecylamine acetate.

Octadecylamine is a waxy material, substantially insoluble in water and very difficult to disperse in water in a form convenient for feeding. The usual practice is to heat the material to soften and melt it and then agitate with water. It is usually necessary to employ steam to keep the chemical feed tank hot and it may be necessary to jacket the feeding line from the chemical feed tank to the point of injection into the steam or condensate line to prevent solidification of the amine in the chemical feed line. These problems therefore add to the cost of feeding octadecylamine.

On the other hand, octadecylamine acetate has definite advantages over the amine in that it is readily dispersible in hot or warm water with moderate agitation and produces relatively stable dispersions. There is thus little difficulty in feeding octadecylamine acetate in the first instance.

However, octadecylamine acetate has a serious disadvantage. Whereas the dispersion of octadecylamine in water in concentrations under discussion (usually 0.5 to 1 percent, but the above comments will also apply in wider ranges such as 0.1 to 5 percent) is alkaline, but

the similar dispersion of octadecylamine acetate is strongly acidic. Thus in concentrations in the range of 0.5 to 1 percent by weight solutions or dispersions of octadecylamine acetate have a pH of approximately 5.3 in most cases, although some commercial grades give a pH in the range of 4.5 to 5.0.

Due to the corrosion inhibitory properties of octadecylamine acetate, no difficulty is caused by this low pH in the chemical feed tank and chemcial feed lines behind the point of feed. However, at the point where the octadecylamine acetate dispersion is injected into the boiler system or other water system at higher temperature, such as in a steam or condensate line, localized corrosion occurs usually in the chemical feed line. It would appear that heat conducted from the steam or condensate line raises the temperature of the chemical feed line locally and causes it to corrode. Likewise, in some cases the steam or condensate line itself corrodes immediately beyond the point of feed of the octadecylamine acetate, presumably because the octadecylamine acetate is not uniformly distributed in the medium immediately.

Octadecylamine on the other hand does not cause difficulty with corrosion either in the chemical feed line or the water system adjacent the point of feed. This is presumably because the pH is much higher, octadecylamine in concentrations of 0.5 to 1.0 percent water dispersions giving a pH of approximately 8.6. Thus we have a situation in which octadecylamine acetate is convenient to feed but corrodes the lines adjacent the point of feed while octadecylamine is difficult to feed but does not cause corrosion difficulties.

I have discovered that both of these difficulties can be overcome by combining octadecylamine and octadecylamine acetate into a blend before dispersing and feeding. The resulting product, when blended in proper proportions, combines the good qualities of both octadecylamine and octadecylamine acetate, and each material overcomes the difficulties presented by the other.

The proportions should be in the range between 40 to 80 percent by weight of octadecylamine and 60 to 20 percent by weight of octadecylamine acetate. For best results the proportions of ocetadecylamine and octadecylamine acetate should be about 3 to 2 by weight. The composition will preferably be merely octadecylamine and octadecylamine acetate, although if any other chemical is to be fed, it may be incorporated in the mixture if desired, providing of course it does not radically lower the pH or otherwise undesirably affect the composition.

A blend of about 60 percent octadecylamine and about 40 percent octadecylamine acetate by weight in a dispersion of 0.5 to 1 percent by weight of chemical on the total weight of water plus chemical has a pH in the range of 5.8 to 7.5. It is desirable in any case to keep the pH in this range, since if the pH is below 5.8 corrosion is likely to occur at the point of feed and if the pH is above 7.5 the blend is more difficult to disperse and acts like octadecylamine in this respect. Accordingly, if the composition has too low a pH more octadecylamine should be added, and if it has too high a pH more octadecylamine acetate should be added within the composition range set forth above.

The table gives the results of corrosion tests describing the behavior of octadecylamine acetate compared with the blend of 60 percent of octadecylamine and 40 percent of octadecylamine acetate by weight at a temperature of 120° F. with oxygen present, and at 212° F. with oxygen absent. The specimens were low carbon steel of the character of AISI 1010, and each solution contains 0.6 percent by weight of the chemical. The pH of the octadecylamine acetate solution was 5.3 and the pH of the blend was 6.2. In each case the blend showed a lower corrosion rate than did the octadecylamine acetate.

Table

	120° F.—Oxygen Present		212° F.—Oxygen Absent	
	Octadecylamine Acetate	60% Octadecylamine; 40% Octadecylamine Acetate	Octadecylamine Acetate	60% Octadecylamine; 40% Octadecylamine Acetate
Average Penetration, inches/yr. (7 day exposure)	0.0007	0.0003	0.0060	0.0034
Average Penetration, inches/yr. (14 day exposure)	0.0013	0.0003	0.0060	0.0034
Differential Ave. Penetration, inches/yr. (7th to 14th day)	0.0020	0.0000	0.0060	0.0033

Octadecylamine acetate is usually manufactured from octadecylamine by neutralizing with acetic acid. The blend of the present invention is conveniently made by neutralizing octadecylamine with only a part of the theoretical amount of acetic acid for complete conversion to the acetate. For best results only 40 percent of the theoretical requirement is used.

The octadecylamine acetate 40 percent, octadecylamine 60 percent blend has a further advantage. Its softening point is approximately 135° F. Octadecylamine has a softening point of 122° F. In rail and truck transportation, temperatures of 125 to 130° F. are encountered with sufficient frequency so that there has been difficulty with solidification of octadecylamine into a solid mass in a container, making it very difficult to remove the chemical at the point of use. On the other hand the blend of octadecylamine 60 percent and octadecylamine acetate 40 percent by weight has been "test shipped" to various parts of the country and has caused no difficulty with solidification. The blend remains in flake form and is easily removed from the container.

Octadecylamine acetate is believed to be unique among the octadecylamine salts in its ability to disperse easily in water since the chloride, sulphate, citrate and tartrate are very insoluble.

A blend of octadecylamine and octadecylamine acetate in water solution can be obtained by starting with the amine and partially neutralizing with acetic acid. This should desirably be followed by dilution with some water

to make a pasty dispersion by agitation. This dispersion can be shipped in this diluted form and is readily further diluted at the point of use. It causes no difficulty in feeding or in feed line corrosion.

It is believed that the best way of making the product of the invention is by proceeding only part way to the formation of the acetate from octadecylamine to end with a solid as this produces a more concentrated product, and can be supplied in smaller containers easier to handle. This form saves in freight by avoiding the presence of water of dilution.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the composition and process shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A water treating composition, comprising a blend of between 40 and 80 percent by weight of octadecylamine and between 60 and 20 percent by weight of octadecylamine acetate.

2. A water treating composition according to claim 1, in which the octadecylamine and octadecylamine acetate are in the approximate proportions of 3 to 2 by weight.

3. A water treating composition according to claim 1, having a pH in water dispersion in the range of 5.8 to 7.5.

4. A water treating composition according to claim 2, having a pH in water dispersion in the range between 5.8 and 7.5.

5. The method of feeding octadecylamine material to water, which comprises first blending octadecylamine and octadecylamine acetate in the proportions of 40 to 80 percent of octadecylamine and 60 to 20 percent of octadecylamine acetate by weight, then dispersing the blend and feeding the blend into water.

6. The method according to claim 5, which comprises first blending the octadecylamine and the octadecylamine acetate in the approximate proportions of 3 to 2 by weight.

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