

impacted by amines in the absence of carboxylic acids. This affect, is a hindrance when a carboxylic acid feed is replaced by an alkyl ester feed such as methylester, in conducting the reaction to produce the esteramine.

[0006] In view of the above drawbacks, there is a need for an improved catalyst that can decrease the esterification or transesterification reaction time for the reaction between alkanolamines and carboxylic acids or fatty acids, or alkyl esters. There is also a need for a catalyst that can produce an esteramine product that is storage stable, has a good color, and has ratios of monoester, diester and triester esteramines that meet existing product specifications for esteramines.

SUMMARY

[0007] Disclosed is a method for decreasing the reaction time between an alkanolamine and a fatty acid alkyl ester, a fatty acid, or a mixture thereof by utilizing a divalent zinc catalyst. In accordance with at least one embodiment of the present technology, the transesterification or esterification reaction can proceed to completion substantively faster than, and in some cases twice as fast as when conventional catalysts are used.

[0007a] In one aspect, there is provided a method for decreasing the reaction time between an alkanolamine and a fatty acid to produce esteramines, the method comprising: providing an alkanolamine; providing a fatty acid; reacting the alkanolamine and the fatty acid in the presence of a divalent zinc catalyst to form at least one esteramine; wherein the zinc catalyst is zinc oxide, zinc carbonate, zinc diphosphinate, zinc triflate, or zinc stearate.

[0008] Suitable alkanolamines include, for example, ethanolamine, diethanolamine, triethanolamine, isopropanolamine, diisopropanolamine, triisopropanolamine, alkyldiethanolamines, alkyldiisopropanolamines, dialkylmonoethanolamines, dialkylmonoisopropanolamines, and combinations thereof. Preferred alkanolamines for the presently described technology are dimethylethanolamine (DMEA) methyldiethanolamine (MDEA) and triethanolamine (TEA). Examples of suitable fatty acid alkyl esters and fatty acids include triglycerides, vegetable oils, fatty acid methylesters, fatty acid ethylesters, stearic acid, tallow fatty acid, derivatives thereof, and combinations thereof.

[0009] The divalent zinc catalyst is added in a usable form to the reaction mixture so that the zinc can be soluble in order for homogeneous catalysis to occur. In some embodiments, the divalent zinc catalyst is in the form of zinc oxide, zinc carbonate, or zinc diphosphinate. In other embodiments, the divalent zinc is in the form of a zinc salt.

[0010] The resulting esteramines of the present technology can be derivitized with a quaternizing agent, such as, for example, methyl chloride or dimethyl sulfate in order to produce a fabric softener or anti-static agent. Other quaternizing agents can also be used, such as epichlorohydrin, or derivatives thereof, such as 3-chloro-2-hydroxypropanesulfonate, sodium salt.

CLAIMS

What Is Claimed Is:

1. A method for decreasing the reaction time between an alkanolamine and a fatty acid to produce esteramines, the method comprising:

providing an alkanolamine;

providing a fatty acid;

reacting the alkanolamine and the fatty acid in the presence of a divalent zinc catalyst to form at least one esteramine; wherein the zinc catalyst is zinc oxide, zinc carbonate, zinc diphosphinate, zinc triflate, or zinc stearate.

2. The method of claim 1, wherein the alkanolamine is selected from the group consisting of ethanolamine, diethanolamine, triethanolamine, triisopropanolamine, alkyldiethanolamines, alkyl-diisopropanolamines, isopropanolamine, diisopropanolamine, dialkylmonoethanolamines, dialkylmonoisopropanolamines, and combinations thereof.

3. The method of claim 1, wherein the alkanolamine is triethanolamine.

4. The method of claim 1, wherein the zinc diphosphinate catalyst is formed *in situ*.

5. The method of claim 1, wherein the reacting occurs at a temperature within the range of 60°C to 300°C.

6. The method of claim 1, wherein the method occurs in the presence of an inert atmosphere.

7. The method of claim 6, wherein the inert atmosphere is nitrogen.

8. The method of claim 1, wherein the reacting occurs at a temperature within the range of 130°C to 190°C.

9. The method of claim 1, wherein the fatty acid is an alkyl acid having from 2 to 30 carbon atoms.

10. The method of claim 9, wherein the alkyl acid has from 5 to 25 carbon atoms.

11. The method of claim 1, wherein the zinc catalyst is present in an amount greater than 1 ppm based on the total weight of the reactants.

12. The method of claim 1, wherein the zinc catalyst is present in an amount of 20 ppm to 5000 ppm based on the total weight of the reactants.

13. The method of claim 1, wherein the zinc catalyst is present in an amount of 100 ppm to 200 ppm based on the total weight of the reactants.

14. The method of claim 1, wherein the alkanolamine and fatty acid are present in a molar ratio of 0.5/1 to 3/1, where the alkanolamine represents the denominator in the ratio.