It is also known to include calcium ions within cleaning composition to inhibit the attack of hydroxide ion on alkali sensitive metals. However, it has proven to be difficult to introduce calcium ions into alkaline cleaners without inducing precipitation of hydroxides of the calcium. This is especially true for highly alkaline solutions, such as concentrated solutions that are intended for dilution into use solutions. Theoretically, the protection against corrosion in such systems is based on the presence of the calcium ion in solution, so precipitation of the calcium ions adversely affects the corrosion inhibiting effectiveness of the system. Additionally, the formulations could not include strong chelating agents that could bind with the calcium ion, and again reduce the effectiveness of the calcium ion as a corrosion inhibiter.

Accordingly, it is an objective of the claimed invention to develop alkaline detergent compositions with improved metal protection, reduced precipitation of particulates, and maintained effective detergency.

A further object of the invention is to provide methods for employing alkaline detergents between pHs from about 9 to about 12.5 without causing significant corrosion of metal surfaces.

BRIEF SUMMARY

An advantage of the present disclosure is the prevention/reduction of corrosion on warewashed surfaces through the application of the detergent compositions of the disclosure which include amino carboxylate. As a result, the aesthetic appearances of the treated substrate surfaces are improved, and particulate matter in the residual wash water is also reduced.

In an embodiment, the present disclosure provides a detergent composition comprising: an amino carboxylate; and an alkalinity source comprising an alkali metal hydroxide, carbonate, metasilicate and/or silicate wherein a use solution of the detergent composition has a pH between about 9 and 12.5. In an aspect, there is provided a solid alkaline detergent composition comprising: from about 0.5 wt. % to about 90 wt. % of an alkalinity source; from about 1 wt. % to about 7.5 wt. % of a surfactant, wherein said surfactant is a nonionic surfactant which is ethoxylated, proproxylated, or both ethoxylated and propoxylated; a metal protecting component comprising a silicate and an amino carboxylate, wherein said metal protecting component comprises 33.5 wt. % or less of said detergent composition. In another aspect, there is provided a solid alkaline detergent composition comprising: from about 35 wt. % to about 80 wt. % of a carbonate alkalinity source; from about 1 wt. % to about 7.5 wt. % of one or more nonionic surfactants wherein said nonionic surfactant is ethoxylated, proproxylated, or both ethoxylated and propoxylated; from about 15 wt. % to about 30 wt. % of a silicate; from about 0.01 to about 3.5 wt. % of an amino carboxylate; from about 0.1 wt. % to about 15 wt. % of a corrosion inhibitor; form about 1 wt. % to about 10 wt. % of chelant; and from about 4 wt. % to about 10 wt. % of water.

The present disclosure also includes methods for protecting aluminum and/or aluminum containing alloys from corrosion by use of the novel corrosion inhibiting composition of the disclosure. The method involves the step of contacting the surface of aluminum, or an aluminum containing alloy with the corrosion inhibiting composition of the disclosure. The novel corrosion inhibiting composition includes one or more aminocarboxylates.

In an aspect, there is provided a method of cleaning ware while preventing magnesium carbonate accumulation from hard water comprising: applying a detergent composition to ware surface; wherein the detergent composition comprises a carbonate alkalinity, a nonionic surfactant wherein said nonionic surfactant is ethoxylated, proproxylated, or both ethoxylated and propoxylated, an amino carboxylate in an amount effective for metal protection and preventing magnesium carbonate accumulation; and a silicate in an amount effective for metal protection; and there after rinsing said ware.

While multiple embodiments are disclosed, still other embodiments of the present disclosure will become apparent to those skilled in the art from the following detailed description, which shows and describes illustrative embodiments of the disclosure. Accordingly, the drawings and detailed description are to be regarded as illustrative in nature and not restrictive.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention relates to detergent compositions employing an amino carboxylate. The detergent compositions have many advantages over conventional alkaline detergents. For example, the detergent compositions provide effective improved metal protection, and reduction of hard water precipitate that can clog dispensers all while maintaining cleaning performance at alkaline conditions from about 9 to about 12.5.

The embodiments of this invention are not limited to particular alkaline detergent compositions, which can vary and are understood by skilled artisans. It is further to be understood that all terminology used herein is for the purpose of describing particular embodiments only, and is not intended to be limiting in any manner or scope. For example, as used in this specification and the appended claims, the singular forms "a," "an" and "the" can include plural referents unless the content clearly indicates otherwise. Further, all units, prefixes, and symbols may be denoted in its SI accepted form. Numeric ranges recited within the specification are inclusive of the numbers defining the range and include each integer within the defined range.

So that the present invention may be more readily understood, certain terms are first defined. Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which embodiments of the invention pertain. Many methods and materials similar, modified, or equivalent to those described herein can be used in the practice of the embodiments of the

What is claimed is:

1. A solid alkaline detergent composition comprising:

from about 0.5 wt. % to about 90 wt. % of an alkalinity source;

from about 1 wt. % to about 7.5 wt. % of a surfactant, wherein said surfactant is a nonionic surfactant which is ethoxylated, proproxylated, or both ethoxylated and propoxylated;

a metal protecting component comprising a silicate and an amino carboxylate, wherein said metal protecting component comprises 33.5 wt. % or less of said detergent composition.

2. The detergent of claim 1 wherein said alkalinity includes an alkali metal hydroxide, or a carbonate.

3. The composition of claim 1, wherein said surfactant includes one or more nonionic surfactants.

4. The composition of claim 1, further comprising a chelant.

5. The composition of claim 1 further comprising a corrosion inhibitor.

6. The composition of claim 1 wherein said source of alkalinity is sodium carbonate.

7. The composition of claim 1 wherein said solid detergent is a pressed solid.

8. The composition of claim 1 wherein said solid detergent is an extruded solid.

9. The composition of claim 1 wherein said solid detergent is a cast solid.

10. A solid alkaline detergent composition comprising:

from about 35 wt. % to about 80 wt. % of a carbonate alkalinity source;

from about 1 wt. % to about 7.5 wt. % of one or more nonionic surfactants wherein said nonionic surfactant is ethoxylated, proproxylated, or both ethoxylated and propoxylated;

from about 15 wt. % to about 30 wt. % of a silicate;

from about 0.01 to about 3.5 wt. % of an amino carboxylate;

from about 0.1 wt. % to about 15 wt. % of a corrosion inhibitor;
form about 1 wt. % to about 10 wt. % of chelant; and
from about 4 wt. % to about 10 wt. % of water.

11. The composition of claim 10, wherein said corrosion inhibitor comprises one or more of a maleic acid co polymer or an acrylic acid polymer.

12. The composition of claim 10, wherein the nonionic surfactant comprises ethylene oxide, propylene oxide, or a combination of ethylene and propylene oxide.

13. The composition of claim 10, wherein the solid detergent is a solid.

14. The composition of claim 10, wherein the solid detergent is a solid selected from the group comprising a cast solid, a pressed solid, or an extruded solid.

15. A method of cleaning ware while preventing magnesium carbonate accumulation from hard water comprising:
applying a detergent composition to ware surface;
wherein the detergent composition comprises a carbonate alkalinity, a nonionic surfactant wherein said nonionic surfactant is ethoxylated, proproxylated, or both ethoxylated and propoxylated,
an amino carboxylate in an amount effective for metal protection and preventing magnesium carbonate accumulation; and
a silicate in an amount effective for metal protection;
and there after rinsing said ware.

16. The method of claim 15 wherein said ware includes an alkaline sensitive metal surface.

17. The method of claim 16 wherein said alkaline sensitive metal includes aluminum.

18. The method of claim 15, further comprising the step of generating a use solution of the detergent composition, wherein the detergent use solution has a pH between about 9 and 12.5.

19. The method of claim 18, wherein the use solution is generated within a ware washing machine.

20. The method of claim 15 wherein said amino carboxylate is present in said detergent composition in an amount of no more than 3.5 wt. %.