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 ~~OF THE INVENTION~~

An advantage of the ~~invention~~ present disclosure is the prevention/reduction of corrosion on warewashed surfaces through the application of the detergent compositions of the ~~invention~~ 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 ~~invention~~ 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; 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 0.5 wt. % to about 90 wt. % of a carbonate alkalinity source; from about 1 wt. % to about 7.5 wt. % of one or more nonionic surfactants; 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.

In a further embodiment, the present ~~invention~~ disclosure provides a method of cleaning while preventing/reducing metal corrosion on a cleaned surface comprising: applying a detergent composition to a substrate surface, wherein the detergent composition comprises an amino carboxylate and an alkalinity source comprising an alkali metal hydroxide, carbonate,

carbonate, metasilicate, silicate and/or combinations of the same, wherein the detergent composition is effective for protecting metal surfaces from corrosion. This is surprising as this result was observed even when the metal protection component was reduced. The detergent composition also help to eliminate suspended particles that can precipitate in hard water situations and that can clog warewash units and dispensers.

The cleaning composition includes an amino carboxylate and any of a variety of other components useful for alkaline cleaning compositions. For example, the composition can include an amino carboxylate, a source of alkalinity, water, surfactant, and/or the like. In an embodiment, the composition can include about 1 wt. % to about 3.5 wt. % amino carboxylate; about 1 wt. % to about 90 wt.% source of alkalinity; about 0 to about 10 wt. % surfactant; with the remainder being other components such as a chelant, silicate metal protectors, fillers, stabilizers, corrosion inhibitors, buffers, fragrance etc. The composition of the ~~invention~~ present disclosure employing amino carboxylate also provides improved metal protection while other traditional metal protectors such as sodium silicate is reduced.

Articles which require such cleaning according to the ~~invention~~ present disclosure includes any article with a surface that contains an alkaline sensitive metal, such as, aluminum or aluminum containing alloys. Such articles can be found in industrial plants, maintenance and repair services, manufacturing facilities, kitchens, and restaurants. Exemplary equipment having a surface containing an alkaline sensitive metals include sinks, cookware, utensils, machine parts, vehicles, tanker trucks, vehicle wheels, work surfaces, tanks, immersion vessels, spray washers, and ultrasonic baths. In addition, a detergent composition is provided according to the ~~invention~~ present disclosure that can be used in environments other than inside a dishwashing machine. Alkaline sensitive metals in need of cleaning are found in several locations. Exemplary locations also include trucks, vehicle wheels, ware, and facilities. One exemplary application of the alkaline sensitive metal cleaning detergent composition for cleaning alkaline sensitive metals can be found in cleaning vehicle wheels in a vehicle washing facility. Compositions including the novel corrosion inhibitor of the ~~invention~~ present disclosure may be used in any of these applications and the like.

The ~~invention~~ present disclosure also includes methods for cleaning aluminum and/or aluminum containing alloys by contacting the surface of the same with the detergent/cleaning compositions of the ~~invention~~ disclosure and rising thereafter.

The ~~invention~~ 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 ~~invention~~disclosure. The method involves the step of contacting the surface of aluminum, or an aluminum containing alloy with the corrosion inhibiting composition of the ~~invention~~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, 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 ~~invention~~ disclosure will become apparent to those skilled in the art from the following detailed description, which shows and describes illustrative embodiments of the ~~invention~~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