# FOAMING LIGHT DUTY LIQUID DETERGENT COMPOSITIONS, METHODS OF MAKING AND USES THEREOF

## *BACKGROUND OF THE INVENTION*

[001] The present technology, in general, relates to foaming light duty liquid (LDL) detergent compositions that provide desirable foaming and increased soil and grease removal properties. Light duty liquid detergent compositions and/or formulations including pre-soak dishwashing liquids and hard surface kitchen and bath cleaners and uses thereof are also disclosed.

[002] Desirable attributes for light duty liquid detergents (LDLs), in general, include the ability to emulsify, suspend or penetrate greasy or oily soils and suspend or disperse particulates, in order to clean articles or surfaces; and then prevent the soils, grease, or particulates from re-depositing on the newly cleaned articles or surfaces. It is also desirable for the light duty liquid to provide sustained foaming in dilute wash solution in the presence of the soils being cleaned. In order to provide the desired properties to rapidly clean grease and baked or dried-on food soils, cleaning solvents have been used, particularly in pre-soak detergents, but they have not been able to provide the foam and foaming longevity sufficient to be used as a dilute wash solution or LDL. Sparingly water-soluble cleaning solvents in particular are known to destroy foam performance. It has been a challenge, for example, for the detergent industry to provide a product that produces useful levels of foam in the presence of large quantities of greasy soil. Surprisingly, the present technology demonstrates one or more formulations of light duty liquid detergent compositions comprising a cleaning solvent that provide cleaning ability while maintaining the desired foaming properties.

## BRIEF SUMMARY OF THE INVENTION

[002a] In one aspect, there is provided a foaming liquid detergent composition comprising:

0.5% to 10% active weight based on the total weight of the composition of at least one cleaning solvent;

6.0% to 40% active weight based on the total weight of the composition of at least one anionic surfactant;

6.0% to 40% active weight based on the total weight of the composition of at least one foam stabilizing surfactant; and

0% to 90% of the total weight of at least one carrier,

wherein the at least one cleaning solvent is selected from the group consisting of methyl laurate, ethyl laurate, methyl myristate, ethyl myristate, C12-C14 methyl ester, C8-14 dimethyl amides, C8-14 diethyl amides, derivatives thereof and combinations thereof; and

wherein the foam stabilizing surfactant is selected from the group consisting of C10-C18 dimethyl amine oxides, C10-C18 amidopropyl betaines, C10-18 amidopropyl betaines, alkyl mono-and di-thanolamides, sulfobetaines, derivatives thereof and combinations thereof;

and

wherein the active weight ratio of the at least one anionic surfactant to the at least one foam stabilizing surfactant is between 2:1 and 1:2.

[003] In one ~~aspect~~example, the present technology provides at least one foaming light duty liquid detergent composition having about 0.5% to about 10% active weight based on the total weight of the composition of at least one cleaning solvent; about 6.0% to about 40% of the total weight of at least one anionic surfactant; about 6.0% to about 40% of the total weight of at least one foam stabilizing surfactant; and 0.0% to about

90% of the total weight of at least one carrier, wherein the cleaning solvent is selected from the group consisting of methyl laurate, ethyl laurate, methyl myristate, ethyl myristate, C12-C14 methyl ester, C8-14 dimethyl amides, C8-14 diethyl amides, derivatives thereof and combinations thereof. In some ~~aspects~~examples, the foaming liquid detergent composition which contains effective levels of sparingly water-soluble cleaning solvent provides nearly equal (similar) foam performance when compared with a liquid detergent composition not containing the selected cleaning solvent.

[004] Another ~~aspect~~example of the present technology provides at least one foaming liquid detergent composition having about 0.5% to about 10% active weight based on the total weight of the composition of at least one cleaning solvent; about 6.0% to about 40% of the total weight of at least one anionic surfactant; about 6.0% to about 40% of the total weight of at least one foam stabilizing surfactant; and 0.0% to about 90% of the total weight of at least one carrier. In some ~~aspects~~examples, the foaming liquid detergent composition exhibits foam performance as measured by foam mileage of at least about 1.6 grams, more preferably at least about 1.8 grams as measured by the automated Crisco-only gram test. The foam mileage generally tracks with the amount of total actives total actives. In some ~~aspects~~examples, the foam mileage of the present technology is measured for compositions with total active amounts of about 23% to about 27% of the composition.

[005] In yet another ~~aspect~~example, the one or more detergent compositions of the present technology exhibit adequate foam performance as measured by foam mileage of at least 10 plates, preferably at least 12 plates as measured by the mini-plate test with Crisco shortening soil. In some ~~aspects~~examples, the foam mileage of the present technology is calculated for compositions with total active amounts of about 23% to about 27% of the composition.

[006] In other ~~aspects~~examples of the present technology, there is provided at least one light duty detergent comprising at least one cleaning solvent, at least one anionic surfactant, and at least one foam stabilizing surfactant, wherein the ratio of the at least one anionic surfactant to the at least one foam stabilizing surfactant is between about 2:1 to about 1:2, preferably about 1:1.

[007] A further ~~aspect~~example of the present technology provides at least one foaming liquid detergent composition including about 0.5% to about 4% active weight based on total weight of at least one cleaning solvent; about 6.0% to about 10% active weight based on total weight of at least one anionic surfactant; about 6.0% to about 15% active weight based on total weight of at least one foam stabilizing surfactant; and 0.0% to about 90% based on total weight of one carrier.

[008] In another ~~aspect~~example, the present technology provides a hard surface cleaner composition comprising about 0.5% to about 10% active weight based on the total weight of the composition of at least one cleaning solvent; about 6.0% to about 15% active weight based on the total weight of the composition of at least one anionic surfactant; about 6.0% to about 40% active weight based on the total weight of the composition of at least one foam stabilizing surfactant; and 0% to about 90% of the total weight of at least one carrier, wherein the cleaning solvent is selected from the group consisting of methyl laurate, ethyl laurate, methyl myristate, ethyl myristate, C12-C14 methyl ester, C8-14 dimethyl amides, C8-14 diethyl amides, derivatives thereof and combinations thereof; and wherein the hard surface cleaner which contains these effective levels of sparingly water-soluble cleaning solvent provides at least equivalent to foam performance when compared with a hard surface cleaner not containing any cleaning solvents. In some ~~aspects~~examples, the hard surface cleaner is diluted at least 1:10 with water. In other ~~aspects~~examples, the hard surface cleaner is diluted at least 1:50, alternatively 1:100, alternatively 1:500, alternatively 1:1000 in water.

[009] In another ~~aspect~~example, the present technology provides a hard surface cleaner wherein the composition comprises about 0.5% to about 4% active weight based on the total weight of at least one cleaning solvent; about 6% to about 10% active weight based on the total weight of at least one anionic surfactant; about 6% to about 15% active weight based on the total weight of at least one foam stabilizing surfactant; and 0% to about 80% based on total weight of at least one carrier.

[010] In another ~~aspect~~example, the present technology provides a pre-soak dishwashing composition comprising: 0.5% to about 10% active weight based on the total weight of at least one cleaning solvent; 6.0% to about 25% active weight based on

the total weight of at least one anionic surfactant; 6.0% to about 25% active weight based on the total weight of at least one foam stabilizing surfactant; and 0.0% to about 90% of the total weight of at least one carrier. In some ~~aspects~~examples, the pre-soak dishwashing composition comprises a cleaning solvent selected from the group consisting of methyl laurate, ethyl laurate, methyl myristate, ethyl myristate, C12-C14 methyl ester, C8-14 dimethyl amides, C8-14 diethyl amides, derivatives thereof and combinations thereof. In some ~~aspects~~examples, the pre-soak dishwashing composition which contains effective levels of sparingly water-soluble cleaning solvent provides at least equivalent foam performance when compared with a pre-soak dishwashing composition not containing any cleaning solvents.

[011] In yet another ~~aspect~~example, the present technology provides a ready to use cleaning composition comprising an at least 1:10 dilution of a composition comprising about 0.5% to about 10% active weight based on the total weight of the composition of at least one cleaning solvent; about 6.0% to about 15% active weight based on the total weight of the composition of at least one anionic surfactant; about 6.0% to about 15% active weight based on the total weight of the composition of at least one foam stabilizing surfactant; and 0% to about 90% of the total weight of at least one carrier. The ready to use cleaning composition comprises a cleaning solvent selected from the group consisting of methyl laurate, ethyl laurate, methyl myristate, ethyl myristate, C12-C14 methyl ester, C8-14 dimethyl amides, C8-14 diethyl amides, derivatives thereof and combinations thereof. The ready to use cleaning composition which contains effective levels of sparingly water-soluble cleaning solvent provides at least equivalent foam performance when compared with a ready to use composition not containing any cleaning solvents.

[012] Yet a still further ~~aspect~~example of the present technology provides at least one hard surface cleaner for use in the kitchen or bath comprising at least one liquid detergent composition including at least one cleaning solvent, at least one anionic surfactant, at least one foam stabilizing surfactant, and a carrier, wherein the composition is dilutable from about 1:10 to about 1:1000 in water.