bargain laundry detergents is not easily inferred from surfactant structure, we performed extensive experimental investigations to identify subclasses of surfactants having desirable performance in these areas.

New surfactant classes are always of interest to formulators of laundry detergents. Surfactants based on renewable resources will continue to be in demand as alternatives to petroleum-based surfactants. Traditional natural sources of fatty acids and esters used for making surfactants generally have predominantly (or exclusively) *cis*- isomers and lack relatively short-chain (e.g., C_{10} or C_{12}) unsaturated fatty portions. Metathesis chemistry provides an opportunity to generate precursors having shorter chains and mostly *trans*- isomers, which could impart improved performance when the precursors are converted to downstream compositions (e.g., in surfactants). Formulators will benefit from identification of particular subclasses of surfactants that derive from renewable sources and have desirable attributes for use in laundry detergents.

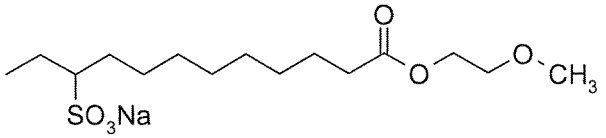
SUMMARY OF THE INVENTION

In one ~~aspect~~embodiment, the present disclosure ~~invention~~ relates to a laundry detergent useful for cold-water cleaning. This detergent comprises an anionic surfactant, a nonionic surfactant, a fatty alkyl ester sulfonate, and a surfactant composition derived from a metathesis-derived C_{10}-C_{17} monounsaturated acid, octadecene-1,18-dioic acid, or their ester derivatives. The metathesis-derived surfactant composition is selected from C_{10} betaines, C_{12} or C_{16} amidoamines, C_{12} ethanolamine amides, C_{16} amidoamine sulfonates, C_{18} diamidoamine dioxides, quaternized C_{18} diamidoamine betaines, sulfonated C_{18} low-EO fatty ester alkoxylates, C_{18} amidoamine carboxylates, and amidoamine oxides and sulfobetaines derived from cross-metathesis of palm or soybean oil.

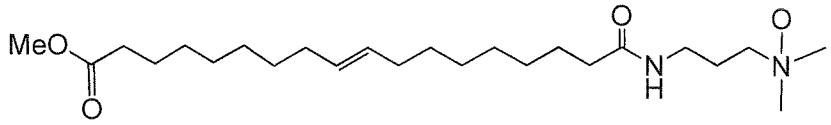
The present disclosure ~~invention~~ includes a boosted bargain laundry detergent. This detergent comprises an anionic surfactant, a nonionic surfactant, and a performance booster derived from a metathesis-derived C_{10}-C_{17} monounsaturated acid, octadecene-1,18-dioic acid, or their ester derivatives and selected from the group consisting of C_{12} low-EO fatty ester alkoxylate sulfonates, C_{18} amidoamine oxide esters, C_{18} amidoamine

oxide carboxylates, and amidoamine sulfobetaines made from self-metathesized palm or soybean oil. In one aspect, there is provided a boosted bargain laundry detergent, comprising 1 to 70 wt.% of an anionic surfactant, 5 to 70 wt.% of a nonionic surfactant, and 0.1 to 5 wt.% of a metathesis-based performance booster selected from the group consisting of:

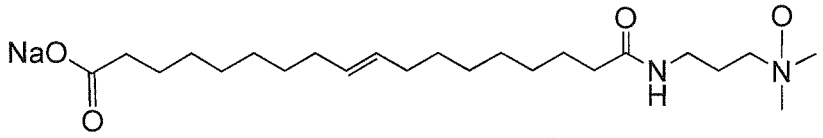
(a) a C_{12} low-EO fatty ester alkoxylate sulfonate having the structure:



(b) a C_{18} amidoamine oxide ester having the structure:

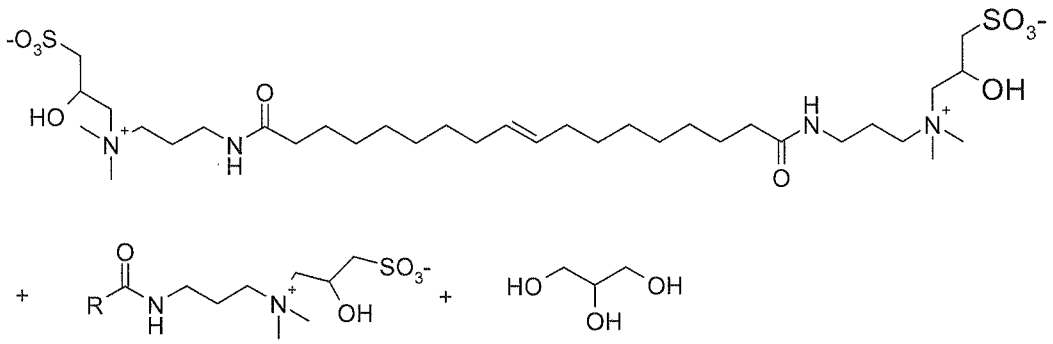


(c) a C_{18} amidoamine oxide carboxylate having the structure:



and

(d) an amidoamine sulfobetaine made from self-metathesized palm or soybean oil having the structure:



The inventive compositions can take many forms, including liquid, powder, paste, granule, tablet, molded solid, water-soluble sheet, or water-soluble sachet. Accordingly, in another aspect, there is provided a liquid, powder, paste, granule, tablet, molded

solid, water-soluble sheet, or water-soluble sachet comprising the detergent as disclosed above. We surprisingly found that the particular classes of surfactant compositions and performance boosters identified above, all derived from renewable resources, rival or outperform commercial standards when tested as either a complement to an alkyl ester sulfonate for cold-water detergents or as a booster for a bargain detergent formula.

DETAILED DESCRIPTION OF THE INVENTION

Detergent compositions useful for cold-water cleaning comprise an anionic surfactant, a nonionic surfactant, a fatty alkyl ester sulfonate, and a surfactant composition derived from a metathesis-derived C_{10}-C_{17} monounsaturated acid, octadecene-1,18-dioic acid, or their ester derivatives. The metathesis-derived surfactant composition is selected from C_{10} betaines, C_{12} or C_{16} amidoamines, C_{12} ethanolamine amides, C_{16} amidoamine sulfonates, C_{18} diamidoamine dioxides, quaternized C_{18} diamidoamine betaines, sulfonated C_{18} low-EO fatty ester alkoxylates, C_{18} amidoamine carboxylates, and amidoamine oxides and sulfobetaines derived from cross-metathesis of palm or soybean oil.

The detergent composition can take any of a number of forms. For example, it can be an isotropic liquid, a surfactant-structured liquid, a granular, spray-dried or dry-blended powder, a tablet, a paste, a molded solid, or any other laundry detergent form known to those skilled in the art. Water soluble sheets or sachets, such as those described in U.S. Pat. Appl. Publ. No. 2002/0187909, which is incorporated herein by reference, are also suitable.

Suitable anionic surfactants are well known in the art. Anionic surfactants generally have a molecular weight below 10,000 and comprise one or more functional groups that exhibit a net anionic charge when in aqueous solution at the normal wash pH, which typically ranges from 6 to 11. Suitable anionic surfactants include C_4-C_{30} carboxylates, fatty alkyl sulfates (alcohol sulfates, "AS"), fatty alkyl ether sulfates (alcohol ether sulfates, "AES"), paraffin sulfonates, olefin sulfonates, alkyl aryl

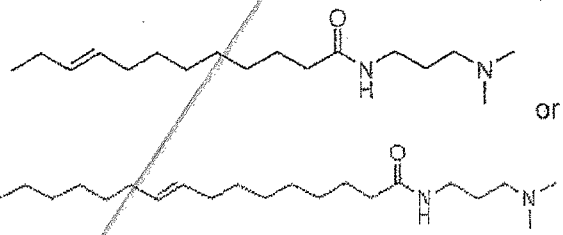
We claim:

1. A laundry detergent useful for cold-water cleaning, comprising an anionic surfactant, a nonionic surfactant, a fatty alkyl ester sulfonate, and a surfactant composition derived from a metathesis-derived C_{10}-C_{17} monounsaturated acid, octadecene-1,18-dioic acid, or their ester derivatives and selected from the group consisting of C_{10} betaines, C_{12} or C_{16} amidoamines, C_{12} ethanolamine amides, C_{16} amidoamine sulfonates, C_{18} diamidoamine dioxides, quaternized C_{18} diamidoamine betaines, sulfonated C_{18} low-EO fatty ester alkoxylates, C_{18} amidoamine carboxylates, and amidoamine oxides and sulfobetaines derived from cross-metathesis of palm or soybean oil.

2. The detergent of claim 1 wherein the composition is selected from the group consisting of C_{10} betaines, C_{12} or C_{16} amidoamines, C_{12} ethanolamine amides, and C_{16} amidoamine sulfonates.

3. The detergent of claim 1 wherein the composition is a C_{12} or C_{16} amidoamine made by reacting a C_{12} or C_{16} monounsaturated acid or ester derivative with dimethylaminopropylamine.

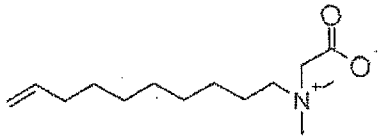
4. The detergent of claim 3 wherein the C_{12} or C_{16} amidoamine has the structure:



or

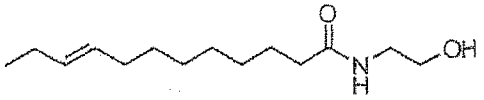
5. The detergent of claim 1 wherein the composition is a C_{10} betaine made by reacting a C_{10} monounsaturated acid or ester derivative with dimethylamine, followed by reduction of the resulting amide, followed by quaternization to give the betaine.

6. The detergent of claim 5 wherein the C_{10} betaine has the structure:

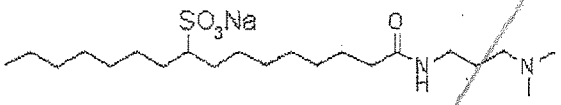


7. The detergent of claim 1 wherein the composition is a C_{12} ethanolamine amide made by reacting a C_{12} monounsaturated acid or ester derivative with monoethanolamine.

8. The detergent of claim 1 wherein the C_{12} ethanolamine amide has the structure:

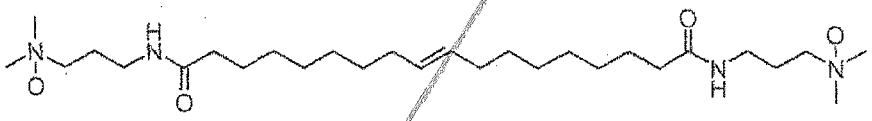


9. The detergent of claim 1 wherein the C_{16} amidoamine sulfonate has the structure:



10. The detergent of claim 1 wherein the composition is a C_{18} diamidoamine dioxide made by reacting an octadecene-1,18-dioic acid or its ester derivative with dimethylaminopropylamine, followed by oxidation of the resulting diamine.

11. The detergent of claim 10 wherein the C_{18} diamidoamine dioxide has the structure:



12. The detergent of claim 1 wherein the composition is an amidoamine oxide or sulfobetaine derived from cross-metathesis of palm or soybean oil.

13. The detergent of claim 1 wherein the nonionic surfactant is a fatty alcohol ethoxylate.

14. The detergent of claim 1 wherein the acid or ester derivative reactant has at least 1 mole % of *trans*-Δ^9 unsaturation.

15. A liquid, powder, paste, granule, tablet, molded solid, water-soluble sheet, or water-soluble sachet comprising the detergent of claim 1.

16. The detergent of claim 1 further comprising water.

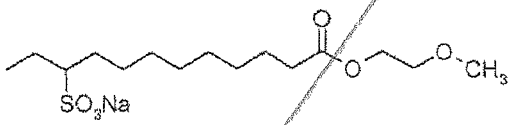
17. A storage-stable liquid detergent of claim 16.

18. The detergent of claim 1 that is a liquid at 20°C and exhibits a phase transition below 5°C.

19. A boosted bargain laundry detergent, comprising an anionic surfactant, a nonionic surfactant, and a performance booster derived from a metathesis-derived C_{10}-C_{17} monounsaturated acid, octadecene-1,18-dioic acid, or their ester derivatives and selected from the group consisting of C_{12} low-EO fatty ester alkoxylate sulfonates, C_{18} amidoamine oxide esters, C_{18} amidoamine oxide carboxylates, and amidoamine sulfobetaines made from self-metathesized palm or soybean oil.

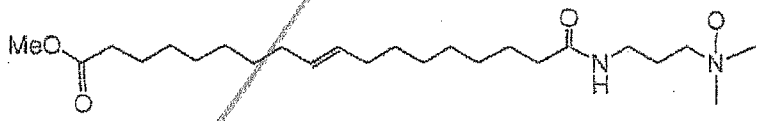
20. The detergent of claim 19 wherein the booster is a C_{12} low-EO fatty ester ethoxylate sulfonate made by reacting a C_{10} monounsaturated acid or ester derivative with an ethylene glycol alkyl ether, followed by sulfitation of the olefin.

21. The detergent of claim 20 wherein the booster has the structure:

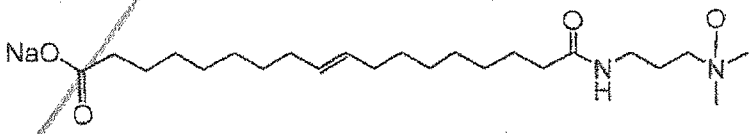


22. The detergent of claim 19 wherein the booster is an amidoamine sulfobetaine made from self-metathesized palm or soybean oil.

23. The detergent of claim 19 wherein the booster is a C_{18} amidoamine oxide ester having the structure:



24. The detergent of claim 19 wherein the booster is a C_{18} amidoamine oxide carboxylate having the structure:



25. The detergent of claim 19 wherein the acid or ester derivative reactant has at least 1 mole % of *trans*-Δ^9 unsaturation.

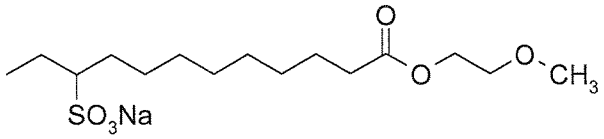
26. The detergent of claim 19 further comprising water.

27. A liquid, powder, paste, granule, tablet, molded solid, water-soluble sheet, or water-soluble sachet comprising the detergent of claim 19.

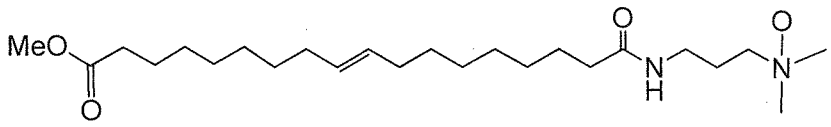
We claim:

1. A boosted bargain laundry detergent, comprising 1 to 70 wt.% of an anionic surfactant, 5 to 70 wt.% of a nonionic surfactant, and 0.1 to 5 wt.% of a metathesis-based performance booster selected from the group consisting of:

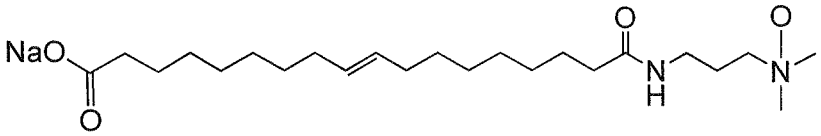
(a) a C_{12} low-EO fatty ester alkoxylate sulfonate having the structure:



(b) a C_{18} amidoamine oxide ester having the structure:

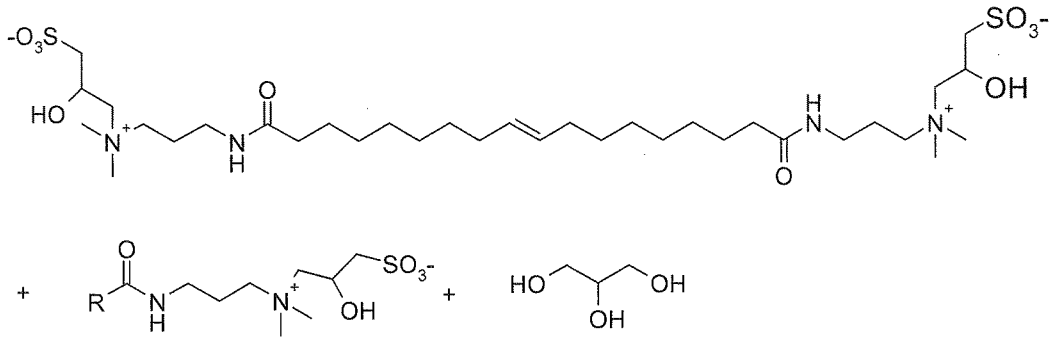


(c) a C_{18} amidoamine oxide carboxylate having the structure:



and

(d) an amidoamine sulfobetaine made from self-metathesized palm or soybean oil having the structure:



R = C16, C18 Sat. + Unsat.

2. The detergent of claim **1** wherein the metathesis-based performance booster has at least 1 mole % of *trans*-Δ^9 unsaturation.

3. The detergent of claim **1** further comprising water.

4. A liquid, powder, paste, granule, tablet, molded solid, water-soluble sheet, or water-soluble sachet comprising the detergent of claim **1**.