CLAIMS

1. A process of preparing a carboxylic acid ester stream with reduced levels of organohalo, glycidyl or other oxirane species, the process comprising:

adding to the carboxylic acid ester stream an effective amount of a carboxylate anion to react with all of the organohalo, glycidyl and oxirane species present in the carboxylate acid ester stream at a temperature of 80 ºC to 275 ºC, wherein the carboxylate anion reacts with the organohalo, glycidyl or oxirane species for a sufficient amount of time to provide a carboxylic acid ester stream with reduced levels of organohalo, glycidyl or other oxirane species.

2. A process of removing organohalo, glycidyl or other oxirane species from a triglyceride oil comprising the steps of:

mixing an effective amount of at least one base to an effective amount of at least one fatty acid to produce an effective amount of at least one carboxylate anion and corresponding cation counterion that is sufficient to remove the organohalo, glycidyl or other oxirane species from the triglyceride oil;

mixing the effective amount of the carboxylate anion with the triglyceride oil at a temperature of about 80 ºC to about 275 ºC, wherein the carboxylate anion reacts with the organohalo, glycidyl or oxirane species for a sufficient amount of time to provide the triglyceride oil with reduced levels of organohalo, glycidyl or other oxirane species.

3. A process of removing or preventing the formation of organohalo, glycidyl or other oxirane species during a processing or a manufacturing procedure for a triglyceride oil comprising the steps of:

making a triglyceride oil feedstock;

adding a sufficient amount of at least one base to react with a sufficient amount of fatty acid within the triglyceride oil feedstock to produce a carboxylate anion and a cation counter ion in an amount sufficient to react with the organohalo, glycidyl and oxirane species present in the feedstock;

incubating the feedstock containing the at least one base at a temperature of about 80 ºC to about 275 ºC for a sufficient amount of time to produce a triglyceride oil with reduced levels of organohalo, glycidyl or other oxirane species.

4. The process of claim 1 or 3, wherein the carboxylate anion is added at the start of the oil processing or manufacturing procedure.

5. The process of claim 3, wherein the process further comprises adding a sufficient amount of at least one fatty acid to react with the at least one base to produce the carboxylate anion and cation counter ion.

6. The process of claim 1 or 3, wherein the carboxylate anion is added after one or more of the processing steps, wherein the processing steps comprise refining, degumming, deodorization, washing, bleaching, distillation, or any combination thereof.

7. The process of claim 3, wherein the carboxylate anion is added after the steps of processing to a purified triglyceride oil.

8. The process of any one of claims 2-3, wherein the triglyceride oil is a C2 to C24 chain triglyceride.

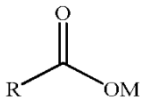
9. The process of claim 8, wherein the triglyceride oil is a C2 to a C18 chain triglyceride.

10. The process of claim 8 or 9, wherein the triglyceride oil is an edible oil.

11. The process of claim 10, wherein any residual organohalo, glycidyl or other oxirane species in the edible oil is removed by a further step of:
deodorizing the triglyceride oil.

12. The process of claim 3 or 4, wherein the cation counterion of the carboxylate anion is an alkali metal, an alkaline earth metal, a transition metal, a nitrogen- or phosphorous-containing cationic species, or combinations thereof.

13. The process of any one of claims 1-3, wherein the carboxylate anion and cation counter ion is of the formula:




wherein R is a C2 through C24 carbon and M is an alkali metal, an alkaline earth metal, a transition metal, or a nitrogen- or phosphorous- containing cationic species.

14. The process of any one of claims 2-3, wherein the at least one base is added in excess of the amount of the organohalo, glycidol or oxirane (ethylene oxide) species within the triglyceride oil.

15. The process of claim 14, wherein the base is provided in about 1.1 to about 10,000 fold molar excess of the amount of organohalo, glycidyl or other oxirane species in the triglyceride oil.

16. The process of claim 14, wherein the base is provided in an amount sufficient to produce at least 350 ppm or more of the carboxylate anion.

17. The process of claim 2 or 3, wherein the processed triglyceride oil comprises less than about 0.5 ppm of organohalo, glycidyl or other oxirane species.

18. The process of claim 17, wherein the triglyceride oil comprises less than about 0.15 ppm of organohalo, glycidyl or other oxirane species.

19. The process of any one of claims 1-3, wherein the preferred temperature range is about 120 °C to about 250 °C.

20. The process of claim 19, wherein the preferred temperature range is from about 180 °C to about 230 °C.

21. The process of claim 1, wherein the carboxylate anion is added in excess of the amount of the organohalo, glycidol or oxirane (ethylene oxide) species within the triglyceride oil.

22. The process of claim 21, wherein the carboxylate anion is provided in an amount of at least 350 ppm or greater.

23. The process of claim 1, wherein the processed carboxylic acid ester stream comprises less than about 0.5 ppm of organohalo, glycidyl or other oxirane species.

24. The process of claim 23, wherein the carboxylic acid ester stream comprises less than about 0.15 ppm of organohalo, glycidyl or other oxirane species.

25. The process of claims 1-3, wherein the metal halide salt or metal alkoxide species resulting from the reaction are removed by an additional processing step.

26. The process of claim of 25, wherein the additional processing step is selected from the group consisting of filtration, washing, centrifuging, winterization, extraction, acidification with a mineral acid, settling, and miscella refining.

27. The process of any of claim 1-3, wherein a sufficient amount of time is greater than 30 minutes.

28. The process of claim 27, wherein a sufficient amount of time is one hour or greater.

29. The process of any of claims 1-3, wherein the oil product is essentially free of organohalo, glycidyl or oxirane species.

30. An oil product with reduced levels of organohalo, glycidyl or oxirane species produced by the process of any one of claims 1-3, wherein reduced levels of organohalo, glycidyl or oxirane species are in comparison to an oil product that does not undergo reaction with an carboxylate anion.

31. The oil product of claim 30, wherein the reduced levels of organohalo, glycidyl or oxirane species is essentially free of organohalo, glycidyl, or oxirane species.

32. The oil product of claim 30, wherein the oil product comprises less than about 0.5 ppm of organohalo, glycidyl or other oxirane species.

33. The oil product of claim 30, wherein the oil comprises less than about 0.15 ppm of organohalo, glycidyl or other oxirane species.

34. The oil product of claim 30, wherein the oil product is an edible oil, a synthetic oil, a vegetable oil or an animal fat oil.

35. The process of claim 1, wherein the carboxylic acid ester stream comprises a carboxylic acid, an alkyl ester of a carboxylic acid, carboxylic anhydride, carboxylic derivatives, acyl halides, carbonates, anhydrides, heteroatom derivatives or combinations thereof.

36. The process of claim 3, wherein the triglyceride feedstock comprises a carboxylic acid, an alkyl ester of a carboxylic acid, carboxylic anhydride, carboxylic derivatives, acyl halides, carbonates, anhydrides, heteroatom derivatives or combinations thereof.

37. The process of claim 2, wherein the triglyceride oil is selected from the group consisting of coconut oil, cochin oil, corn oil, cottonseed oil, linseed oil, olive oil, palm oil, palm kernel oil, peanut oil, soybean oil, sunflower oil, tall oils, tallow, lesquerella oil, tung oil, tea seed oil, whale oil, sesame seed oil, safflower oil, rapeseed oil, fish oils, avocado oil, mustard oil, rice bran oil, almond oil, walnut oil, derivatives thereof and combinations thereof.

## Claims

1. A process of preparing a carboxylic acid ester stream with reduced levels of organohalo, glycidyl or other oxirane species, the process comprising:

adding to the carboxylic acid ester stream an effective amount of a carboxylate anion to react with all of the organohalo, glycidyl and oxirane species present in the carboxylate acid ester stream at a temperature of 80 °C to 275 °C, wherein the carboxylate anion reacts with the organohalo, glycidyl or oxirane species for a sufficient amount of time to provide a carboxylic acid ester stream with reduced levels of organohalo, glycidyl or other oxirane species.

2. A process of removing organohalo, glycidyl or other oxirane species from a triglyceride oil comprising the steps of:

mixing an effective amount of at least one base to an effective amount of at least one fatty acid to produce an effective amount of at least one carboxylate anion and corresponding cation counterion that is sufficient to remove the organohalo, glycidyl or other oxirane species from the triglyceride oil;

mixing the effective amount of the carboxylate anion with the triglyceride oil at a temperature of about 80 °C to about 275 °C, wherein the carboxylate anion reacts with the organohalo, glycidyl or oxirane species for a sufficient amount of time to provide a triglyceride oil product with reduced levels of organohalo, glycidyl or other oxirane species.

3. A process of removing or preventing the formation of organohalo, glycidyl or other oxirane species during a processing or a manufacturing procedure for a triglyceride oil comprising the steps of:

making a triglyceride oil feedstock;

adding a sufficient amount of at least one base to react with a sufficient amount of fatty acid within the triglyceride oil feedstock to produce a carboxylate anion and a cation counter ion in an amount sufficient to react with the organohalo, glycidyl and oxirane species present in the feedstock;

incubating the feedstock containing the at least one base at a temperature of about 80 ℃ to about 275 ℃ for a sufficient amount of time to produce a triglyceride oil with reduced levels of organohalo, glycidyl or other oxirane species.

4. The process of claim 1, wherein the carboxylate anion is added at the start of the oil processing or manufacturing procedure.

5. The process of claim 3, wherein the process further comprises adding a sufficient amount of at least one fatty acid to react with the at least one base to produce the carboxylate anion and cation counter ion.

6. The process of claim 1, wherein the carboxylate anion is added after one or more of the processing steps, wherein the processing steps comprise refining, degumming, deodorization, washing, bleaching, distillation, or any combination thereof.

7. The process of claim 3, wherein the carboxylate anion is added after the steps of processing to a purified triglyceride oil.

8. The process of claim 3, wherein the triglyceride oil is a C2 to C24 chain triglyceride.

9. The process of claim 8, wherein the triglyceride oil is a C2 to a C18 chain triglyceride.

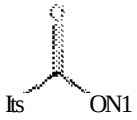
10. The process of claim 8, wherein the triglyceride oil is an edible oil.

11. The process of claim 10, wherein any residual organohalo, glycidyl or other oxirane species in the edible oil is removed by a further step of:

deodorizing the triglyceride oil.

12. The process of claim 3, wherein the cation counterion of the carboxylate anion is an alkali metal, an alkaline earth metal, a transition metal, a nitrogen- or phosphorous-containing cationic species, or combinations thereof.

13. The process of claim 3, wherein the carboxylate anion and cation counter ion is of the formula:



wherein R is a C2 through C24 carbon and M is an alkali metal, an alkaline earth metal, a transition metal, or a nitrogen- or phosphorous- containing cationic species.

14. The process of claim 3, wherein the at least one base is added in excess of the amount of the organohalo, glycidol or oxirane (ethylene oxide) species within the triglyceride oil.

15. The process of claim 14, wherein the base is provided in about 1.1 to about 10,000 fold molar excess of the amount of organohalo, glycidyl or other oxirane species in the triglyceride oil.

16. The process of claim 14, wherein the base is provided in an amount sufficient to produce at least 350 ppm or more of the carboxylate anion.

17. The process of claim 3, wherein the processed triglyceride oil comprises less than about 0.5 ppm of organohalo, glycidyl or other oxirane species.

18. The process of claim 17, wherein the triglyceride oil comprises less than about 0.15 ppm of organohalo, glycidyl or other oxirane species.

19. The process of claim 18, wherein the preferred temperature range is about 120 °C to about 250 °C.

20. The process of claim 19, wherein the preferred temperature range is from about 180 °C to about 230 °C.

21. The process of claim 3, wherein the carboxylate anion is added in excess of the amount of the organohalo, glycidol or oxirane (ethylene oxide) species within the triglyceride oil.

22. The process of claim 21, wherein the carboxylate anion is provided in an amount of at least 350 ppm or greater.

23. The process of claim 1, wherein the processed carboxylic acid ester stream comprises less than about 0.5 ppm of organohalo, glycidyl or other oxirane species.

24. The process of claim 23, wherein the carboxylic acid ester stream comprises less than about 0.15 ppm of organohalo, glycidyl or other oxirane species.

25. The process of claim 1, wherein a metal halide salt or metal alkoxide species resulting from the reaction are removed by an additional processing step.

26. The process of claim of 25, wherein the additional processing step is selected from the group consisting of filtration, washing, centrifuging, winterization, extraction, acidification with a mineral acid, settling, and miscella refining.

27. The process of claim 1, wherein a sufficient amount of time is greater than 30 minutes.

28. The process of claim 27, wherein a sufficient amount of time is one hour or greater.

29. The process of claim 2, wherein the triglyceride oil product is essentially free of organohalo, glycidyl or oxirane species.

30. The triglyceride oil product with reduced levels of organohalo, glycidyl or oxirane species produced by the process of claim 2, wherein reduced levels of organohalo, glycidyl or oxirane species are in comparison to an oil product that does not undergo reaction with an carboxylate anion.

31. The triglyceride oil product of claim 30, wherein the oil product is essentially free of organohalo, glycidyl or oxirane species.

32. The triglyceride oil product of claim 30, wherein the triglyceride oil product comprises less than about 0.5 ppm of organohalo, glycidyl or other oxirane species.

33. The triglyceride oil product of claim 30, wherein the triglyceride oil product comprises less than about 0.15 ppm of organohalo, glycidyl or other oxirane species.

34. The triglyceride oil product of claim 33, wherein the oil product is an edible oil, a synthetic oil, a vegetable oil or an animal fat oil.

35. The process of claim 1, wherein the carboxylic acid ester stream comprises a carboxylic acid, an alkyl ester of a carboxylic acid, carboxylic anhydride, carboxylic derivatives, acyl halides, carbonates, anhydrides, heteroatom derivatives or combinations thereof.

36. The process of claim 3, wherein the triglyceride oil feedstock comprises a carboxylic acid, an alkyl ester of a carboxylic acid, carboxylic anhydride, carboxylic derivatives, acyl halides, carbonates, anhydrides, heteroatom derivatives or combinations thereof.

37. The process of claim 2, wherein the triglyceride oil is selected from the group consisting of coconut oil, cochin oil, corn oil, cottonseed oil, linseed oil, olive oil, palm oil, palm kernel oil, peanut oil, soybean oil, sunflower oil, tall oils, tallow, lesquerella oil, tung oil, tea seed oil, whale oil, sesame seed oil, safflower oil, rapeseed oil, fish oils, avocado oil, mustard oil, rice bran oil, almond oil, walnut oil, derivatives thereof and combinations thereof.