Claims

1. Process for separation of a processed vegetable fat (PVF), wherein said process comprises the steps of

- in a distillation step (DIS), distilling the processed vegetable fat (PVF) into a distillate part (DPT) comprising stearic and oleic acid and/or esters thereof, and a distilled vegetable fat (DVF),
- in a first fractionation step (DFR) fractionating the distilled vegetable fat (DVF) into a first higher melting point fraction (FHF) being rich in tri-stearate triglycerides (StStSt, where St = stearic acid) and di-stearate diglycerides (StSt) and a first lower melting point fraction (FLF), and
- in a second fractionation step fractionating the first lower melting point fraction (FLF) into a second higher melting point fraction (SHF) being rich in 1,3-distearyl-2-oleyl-triglycerides (StOSt, where O = oleic acid), and a second lower melting point fraction (SLF) being rich in 1-stearyl-2,3-dioleyl-triglycerides (StOO) and trioleate-triglycerides (OOO) in a solvent fractionation process (SFR).

2. Process according to claim 1, wherein the process comprises an enzymatic transesterification step of feeding the initial input vegetable fat (IVF) and a stearic acid source (ST) into a reaction system (ETE), in which said processed vegetable fat (PVF) is produced from the initial input vegetable fat (IVF) and the stearic acid source (ST) under influence of enzymes having 1,3-specific transesterification activity, and a step of feeding the processed vegetable fat (PVF) obtained from the reaction system (ETE) into the distillation step (DIS).

3. Process according to any of the preceding claims, wherein the reaction system (ETE) produces said processed vegetable fat (PVF) on the basis of an input vegetable fat (IVF), a stearic acids source (ST), and enzymes having 1,3-specific transesterification activity.

4. Process according to any of the preceding claims, wherein the distillate part (DPT) comprising the stearic and oleic acid and/or esters thereof distilled from the processed vegetable fat (PVF) is fed back in said reaction system (ETE) and is used at least partly as a stearic acid source (ST) for the transesterification in said reaction system (ETE).

5. Process according to claim 4, wherein said distillate part (DPT) is fed through a hydrogenation step (HYD) before being fed back in said reaction system (ETE).

6. Process according to any of the preceding claims, wherein the process comprises a subsequent step of

- feeding the second lower melting point fraction (SLF) back into said reaction system (ETE).

7. Process according to any of the preceding claims, wherein the stearic acid source (ST) comprises stearic acid esters.

8. Process according to any of the preceding claims, wherein the distilled vegetable fat (DVF) comprises less than 1% by weight of free fatty acid and/or esters.

9. Process according to any of the preceding claims, wherein the distilled vegetable fat (DVF) comprises between 0 and 1 percent by weight of stearic acid, oleic acid, and/or esters thereof.

10. Process according to any of the preceding claims, wherein the stearic acid, oleic acid, and/or esters thereof are distilled completely off the processed vegetable fat (PVF) in the distillation (DIS).

11. Process according to any of the preceding claims, wherein the concentration of StSt diglycerides in the second higher melting point fraction (SHF) is less than 5 percent by weight, preferably less than 4 percent by weight, more preferably less

than 3 percent by weight, more preferably less than 2 percent by weight, more preferably less than 1.5 percent by weight, such as less than 1 percent by weight, such as less than 0.8 percent by weight, such as less than 0.6 percent by weight, such as less than 0.4 percent by weight, such as less than 0.2 percent by weight.

12. Process according to any of the preceding claims, wherein the concentration of StSt diglycerides in the first lower melting point fraction (FLF) is less than 3 percent by weight, preferably less than 2 percent by weight, more preferably less than 1.5 percent by weight, such as less than 1 percent by weight, such as less than 0.8 percent by weight, such as less than 0.6 percent by weight, such as less than 0.4 percent by weight, such as less than 0.2 percent by weight.

13. Process according to any of the preceding claims, wherein the second higher melting point fraction (SHF) is subjected to a step of removing esters of stearic and/or oleic acid.

14. Process according to any of the preceding claims, wherein the second higher melting point fraction (SHF) is subjected to a deodorization step (DEO).

15. Process according to any of the preceding claims, wherein the distilled vegetable fat (DVF) has a relative content of free fatty acids and/or esters thereof being lower than 1 percent by weight.

16. Process according to any of the preceding claims, wherein the distilled vegetable fat (DVF) has a relative content of free fatty acids and/or esters thereof being lower than 0.5 percent by weight.

17. Process according to any of the preceding claims,
wherein the first fractionation step (DFR) is a dry fractionation process (DFR).

18. Process according to any of the preceding claims,

wherein the first fractionation step (DFR) is a solvent fractionation process using a first fractionation solvent.

19. Process according to any of the preceding claims,
wherein the first fractionation solvent comprises hexane.

20. Process according to any of the preceding claims,
wherein the dry fractionation (DFR) comprises the steps of

- heating the distilled vegetable fat (DVF) to a first temperature (T1) to melt the distilled vegetable fat (DVF), said first temperature (T1) being at least the melting temperature of the distilled vegetable fat (DVF),
- cooling the distilled vegetable fat (DVF) to a second temperature (T2) such that the first higher melting point fraction (FHF) precipitates from the first lower melting point fraction (FLF), and the first lower melting point fraction (FHF) remains a liquid, and
- separating the first higher melting point fraction (FHF) from the first lower melting point fraction (FLF).

21. Process according to claim 20,
wherein the step of separating the first higher melting point fraction (FHF) from the first lower melting point fraction (FLF) comprises separation by liquid-solid separation.

22. Process according to claim 21,
wherein the liquid-solid separation comprises a step of filtering.

23. Process according to any claims 20-22,
wherein said first temperature (T1) is at least 15°C above the second temperature (T2), such as 20°C degrees above the second temperature (T2).

24. Process according to any of claims 20-23,

wherein said first temperature (T1) is at least 50°C, such as e.g. 60°C.

25. Process according to any of claims 20-24,
wherein the step of cooling the distilled vegetable fat (DVF) is performed at a cooling rate, said cooling rate being between 0.1°C per minute and 3°C per minute, such as between 0,5 and 1°C/minute.

26. Process according to any of claim 20-25,
wherein the step of cooling the distilled vegetable fat (DVF) comprises at least one cooling cycle, said cooling cycle comprising a step of

- cooling by at a cooling cycle cooling rate from a starting temperature (Tstart) to an end temperature (Tend).

27. Process according to claim 26,
wherein said cooling cycle furthermore comprises a step of

- keeping the temperature constant for a predefined time period after said step of cooling by a first cooling rate.

28. Process according to claim 26 or 27,
wherein said step of cooling the distilled vegetable fat (DVF) comprises a plurality of cooling cycles.

29. Process according to any of claims 20-28,
wherein said second temperature (T2) is between 20°C and 40°C.

30. Process according to any of claims 20-29,
wherein the temperature of the distilled vegetable fat (DVF) is kept constant for a predefined holding time period after cooling the distilled vegetable fat (DVF) to the second temperature (T2).

31. Process according to any of claims 25-30,

wherein the relative content of StStSt and/or StSt in the first higher melting point fraction (FHF) is increased by lowering at least one cooling rate.

32. Process according to any of claims 25-31,
wherein the relative content of StOSt in the first lower melting point fraction (FLF) is increased by lowering at least one cooling rate.

33. Process according to any of claims 25-32,
wherein the relative content of StOO and/or OOO in the first lower melting point fraction (FLF) is increased by lowering at least one cooling rate.

34. Process according to any of claims 20-33,
wherein the relative content of StSt in the first higher melting point fraction (FLF) is increased by lowering the second temperature (T2).

35. Process according to any of the preceding claims,
wherein the second higher melting point fraction (SHF) has an improved crystallization characteristics as a component in a cocoa butter equivalent.

36. Process according to any of the preceding claims,
wherein said second lower melting point fraction (SLF) furthermore comprises and mono- or di-unsaturated diglycerides (StO, OO).

37. Process according to any of the preceding claims,
wherein said first fractionation (DFR) comprises the steps of

- heating said distilled vegetable fat (DVF) to a temperature where it is completely melted,
- cooling said distilled vegetable fat (DVF) to a temperature where the first higher melting point fraction (FHF) crystallizes, and
- separating the crystallized first higher melting point fraction (FHF) from the first lower melting point fraction (FLF).

38. Process according to any of the preceding claims,
wherein said second fractionation (SFR) comprises the steps of
- adding a second fractionation solvent,
- heating said first lower melting point fraction (FLF) to a temperature where it is completely melted,
- cooling said first lower melting point fraction (FLF) to a temperature where the second higher melting point fraction (SHF) crystallizes, and
- separating the crystallized second higher melting point fraction (SHF) from the second lower melting point fraction (SLF).

39. Process according to any of the preceding claims,
wherein said second fractionation (SFR) furthermore comprises separating the second fractionation solvent from the second lower melting point fraction (SLF).

40. Process according to any of the preceding claims,
wherein said second fractionation (SFR) furthermore comprises separating the second fractionation solvent from the second higher melting point fraction (SHF).

41. Process according to any of the preceding claims,
wherein the second fractionation solvent comprises acetone.

42. Process according to any of the preceding claims,
wherein the second fractionation solvent comprises hexane.

43. Process according to any of the preceding claims,
wherein said input vegetable fat (IVF) is obtained by refining a crude vegetable fat (RVF) in a refining step (REF).

44. Process according to any of the preceding claims,

wherein the crude vegetable fat (RVF) comprises shea fat or a fraction thereof, such as a lower melting point fraction of shea fat.

45. Process according to any of the preceding claims,
wherein the concentration of StSt in the processed vegetable fat (PVF) is at least 1.5 percent by weight.

46. Process according to any of the preceding claims,
wherein the concentration of StStSt in the first lower melting point fraction (FLF) is between 0 and 5 percent by weight, such as between 0 and 4 percent by weight, such as between 0 and 3 percent by weight, such as between 0 and 2 percent by weight, such as between 0 and 1 percent by weight, such as between 0 and 0.5 percent by weight, such as between 0 and 0.1 percent by weight.

47. Process according to any of the preceding claims,
wherein said second higher melting point fraction (SHF) is being rich in StOSt, and
wherein said second lower melting point fraction is being (SLF) rich in StOO and OOO.

48. Process according to any of the preceding claims,
wherein said second higher melting point fraction (SHF) has a concentration of StSt diglycerides being between 0 and 4 percent by weight, such as between 0 and 3 percent by weight, such as between 0 and 2 percent by weight, such as between 0 and 1 percent by weight, such as between 0 and 0.5 percent by weight, such as between 0 and 0.2 percent by weight, such as between 0 and 0.1 percent by weight.

49. Process according to any of the preceding claims,
wherein said second higher melting point fraction (SHF) has a concentration of diglycerides being between 0% and 3 percent by weight.

50. Process according to claim 49,

wherein said second higher melting point fraction (SHF) has a concentration of diglycerides being between 0% and 2 percent by weight.

51. Vegetable fat product prepared from a second higher melting point fraction (SHF) obtained by a process according to any of claims 1-50.

CLAIMS

1. A process for separation of a processed vegetable fat (PVF), in which the process comprises the steps of:

in a distillation step (DIS), distilling the processed vegetable fat (PVF) into a distillate part (DPT) comprising stearic and oleic acid and/or esters thereof, and a distilled vegetable fat (DVF),

in a first fractionation step (DFR) fractionating the distilled vegetable fat (DVF) into a first higher melting point fraction (FHF) being rich in tri-stearate triglycerides (StStSt, where St = stearic acid) and di-stearate diglycerides (StSt) and a first lower melting point fraction (FLF), and

in a second fractionation step fractionating the first lower melting point fraction (FLF) into a second higher melting point fraction (SHF) being rich in 1,3-distearyl-2-oleyl-triglycerides (StOSt, where O = oleic acid), and a second lower melting point fraction (SLF) being rich in 1-stearyl-2,3-dioleyl-triglycerides (StOO) and trioleate-triglycerides (OOO) in a solvent fractionation process (SFR).

2. A process according to Claim 1, in which the process comprises an enzymatic transesterification step of feeding an initial input vegetable fat (IVF) and a stearic acid source (ST) into a reaction system (ETE), in which the processed vegetable fat (PVF) is produced from the initial input vegetable fat (IVF) and the stearic acid source (ST) under influence of enzymes having 1,3-specific transesterification activity, and a step of feeding the processed vegetable fat (PVF) obtained from the reaction system (ETE) into the distillation step (DIS).

3. A process according to Claim 1 or 2, in which the reaction system (ETE) produces the processed vegetable fat (PVF) on the basis of an input vegetable fat (IVF), a stearic acids source (ST), and enzymes having 1,3-specific transesterification activity.

4. A process according to Claim 1, 2 or 3, in which the distillate part (DPT) comprising the stearic and oleic acid and/or esters thereof distilled from the processed vegetable fat (PVF) is fed back in the reaction system (ETE) and is used at least partly as a stearic acid source (ST) for the transesterification in the reaction system (ETE).

5. A process according to Claim 4, in which the distillate part (DPT) is fed through a hydrogenation step (HYD) before being fed back in the reaction system (ETE).

6. A process according to any preceding claim, in which the process comprises a subsequent step of feeding the second lower melting point fraction (SLF) back into the reaction system (ETE).

7. A process according to any preceding claim, in which the stearic acid source (ST) comprises stearic acid esters.

8. A process according to any preceding claim, in which the distilled vegetable fat (DVF) comprises less than 1% by weight of free fatty acid and/or esters.

9. A process according to any preceding claim, in which the distilled vegetable fat (DVF) comprises between 0 and 1 percent by weight of stearic acid, oleic acid, and/or esters thereof.

10. A process according to any preceding claim, in which the stearic acid, oleic acid, and/or esters thereof are distilled completely off the processed vegetable fat (PVF) in the distillation (DIS).

11. A process according to any preceding claim, in which the concentration of StSt diglycerides in the second higher melting point fraction (SHF) is less than 5 percent by weight, preferably less than 4 percent by weight, more preferably less than 3 percent by weight, more preferably less than 2 percent by weight, more preferably less than 1.5 percent by weight, such as less than 1 percent by weight, such as less than 0.8 percent by weight, such as less than 0.6 percent by weight, such as less than 0.4 percent by weight, such as less than 0.2 percent by weight.

12. A process according to any preceding claim, in which the concentration of StSt diglycerides in the first lower melting point fraction (FLF) is less than 3 percent by weight, preferably less than 2 percent by weight, more preferably less than 1.5 percent by weight, such as less than 1 percent by weight, such as less than 0.8 percent by weight, such as less than 0.6 percent by weight, such as less than 0.4 percent by weight, such as less than 0.2 percent by weight.

13. A process according to any preceding claim, in which the second higher melting point fraction (SHF) is subjected to a step of removing esters of stearic and/or oleic acid.

14. A process according to any preceding claim, in which the second higher melting point fraction (SHF) is subjected to a deodorization step (DEO).

15. A process according to any preceding claim, in which the distilled vegetable fat (DVF) has a relative content of free fatty acids and/or esters thereof being lower than 1 percent by weight.

16. A process according to any preceding claim, in which the distilled vegetable fat (DVF) has a relative content of free fatty acids and/or esters thereof being lower than 0.5 percent by weight.

17. A process according to any preceding claim, in which the first fractionation step (DFR) is a dry fractionation process (DFR).

18. A process according to any preceding claim, in which the first fractionation step (DFR) is a solvent fractionation process using a first fractionation solvent.

19. A process according to any preceding claim, in which the first fractionation solvent comprises hexane.

20. A process according to Claim 17 or any claim dependent thereon, in which the dry fractionation (DFR) comprises the steps of:

heating the distilled vegetable fat (DVF) to a first temperature (T1) to melt the distilled vegetable fat (DVF), the first temperature (T1) being at least the melting temperature of the distilled vegetable fat (DVF),

cooling the distilled vegetable fat (DVF) to a second temperature (T2) such that the first higher melting point fraction (FHF) precipitates from the first lower melting point fraction (FLF), and the first lower melting point fraction (FHF) remains a liquid, and

separating the first higher melting point fraction (FHF) from the first lower melting point fraction (FLF).

21. A process according to Claim 20, in which the step of separating the first higher melting point fraction (FHF) from the first lower melting point fraction (FLF) comprises separation by liquid-solid separation.

22. A process according to Claim 21, in which the liquid-solid separation comprises a step of filtering.

23. A process according to any Claims 20 to 22, in which the first temperature (T1) is at least 15°C above the second temperature (T2), such as 20°C degrees above the second temperature (T2).

24. A process according to any of Claims 20 to 23, in which the first temperature (T1) is at least 50°C, such as e.g. 60°C.

25. A process according to any of Claims 20 to 24, in which the step of cooling the distilled vegetable fat (DVF) is performed at a cooling rate, the cooling rate being between 0.1°C per minute and 3°C per minute, such as between 0,5 and 1°C/minute.

26. A process according to any of Claims 20 to 25, in which the step of cooling the distilled vegetable fat (DVF) comprises at least one cooling cycle, the cooling cycle comprising a step of cooling by at a cooling cycle cooling rate from a starting temperature (Tstart) to an end temperature (Tend).

27. A process according to Claim 26, in which the cooling cycle furthermore comprises a step of keeping the temperature constant for a predefined time period after the step of cooling by a first cooling rate.

28. A process according to Claim 26 or 27, in which the step of cooling the distilled vegetable fat (DVF) comprises a plurality of cooling cycles.

29. A process according to any of Claims 20 to 28, in which the second temperature (T2) is between 20°C and 40°C.

30. A process according to any of Claims 20 to 29, in which the temperature of the distilled vegetable fat (DVF) is kept constant for a predefined holding time period after cooling the distilled vegetable fat (DVF) to the second temperature (T2).

31. A process according to any of Claims 25 to 30, in which the relative content of StStSt and/or StSt in the first higher melting point fraction (FHF) is increased by lowering at least one cooling rate.

32. A process according to any of Claims 25 to 31, in which the relative content of StOSt in the first lower melting point fraction (FLF) is increased by lowering at least one cooling rate.

33. A process according to any of Claims 25 to 32, in which the relative content of StOO and/or OOO in the first lower melting point fraction (FLF) is increased by lowering at least one cooling rate.

34. A process according to any of Claims 20 to 33, in which the relative content of StSt in the first higher melting point fraction (FLF) is increased by lowering the second temperature (T2).

35. A process according to any preceding claim, in which the second higher melting point fraction (SHF) has an improved crystallization characteristics as a component in a cocoa butter equivalent.

36. A process according to any preceding claim, in which the second lower melting point fraction (SLF) furthermore comprises and mono- or di-unsaturated diglycerides (StO, OO).

37. A process according to any preceding claim, in which the first fractionation (DFR) comprises the steps of:

heating the distilled vegetable fat (DVF) to a temperature where it is completely melted,

cooling the distilled vegetable fat (DVF) to a temperature where the first higher melting point fraction (FHF) crystallizes, and

separating the crystallized first higher melting point fraction (FHF) from the first lower melting point fraction (FLF).

38. A process according to any preceding claim, in which the second fractionation (SFR) comprises the steps of:

adding a second fractionation solvent,

heating the first lower melting point fraction (FLF) to a temperature where it is completely melted,

cooling the first lower melting point fraction (FLF) to a temperature where the second higher melting point fraction (SHF) crystallizes, and

separating the crystallized second higher melting point fraction (SHF) from the second lower melting point fraction (SLF).

39. A process according to any preceding claim, in which the second fractionation (SFR) furthermore comprises separating the second fractionation solvent from the second lower melting point fraction (SLF).

40. A process according to any preceding claim, in which the second fractionation (SFR) furthermore comprises separating the second fractionation solvent from the second higher melting point fraction (SHF).

41. A process according to any preceding claim, in which the second fractionation solvent comprises acetone.

42. A process according to any preceding claim, in which the second fractionation solvent comprises hexane.

43. A process according any preceding claim, in which an input vegetable fat (IVF) is obtained by refining a crude vegetable fat (RVF) in a refining step (REF).

44. A process according to any preceding claim, in which the crude vegetable fat (RVF) comprises shea fat or a fraction thereof, such as a lower melting point fraction of shea fat.

45. A process according to any preceding claim, in which the concentration of StSt in the processed vegetable fat (PVF) is at least 1.5 percent by weight.

46. A process according to any preceding claim, in which the concentration of StStSt in the first lower melting point fraction (FLF) is between 0 and 5 percent by weight, such as between 0 and 4 percent by weight, such as between 0 and 3 percent by weight, such as between 0 and 2 percent by weight, such as between 0 and 1 percent by weight, such as between 0 and 0.5 percent by weight, such as between 0 and 0.1 percent by weight.

47. A process according to any preceding claim, in which the second higher melting point fraction (SHF) is being rich in StOSt, and in which the second lower melting point fraction is being (SLF) rich in StOO and OOO.

48. A process according to any preceding claim, in which the second higher melting point fraction (SHF) has a concentration of StSt diglycerides being between 0 and 4 percent by weight, such as between 0 and 3 percent by weight, such as between 0 and 2 percent by weight, such as between 0 and 1 percent by weight, such as between 0 and 0.5 percent by

weight, such as between 0 and 0.2 percent by weight, such as between 0 and 0.1 percent by weight.

49. A process according to any preceding claim, in which the second higher melting point fraction (SHF) has a concentration of diglycerides being between 0% and 3 percent by weight.

50. A process according to Claim 49, in which the second higher melting point fraction (SHF) has a concentration of diglycerides being between 0% and 2 percent by weight.

51. A vegetable fat product prepared from a second higher melting point fraction (SHF) obtained by a process according to any preceding claim, in which the concentration of StSt diglyceride is less than 5 percent by weight.