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TRIGLYCERIDE COMPOSITIONS

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This invention in general relates to triglyceride compositions. More specifically, the invention relates to triglyceride compositions prepared by interesterification of defined mixtures of animal and vegetable fats, hydrogenated products thereof, and to shortenings and other fat compositions containing said compositions.

In order to produce a shortening having plastic properties over a wide temperature range, the shortening is usually compounded from a soft base oil and a relatively small amount of a fully hydrogenated oil often referred to as a plasticizer. An ideal base oil remains fluid over a long temperature range, and the plasticizer remains in a solid state over the same temperature range. To the combination of these two which are often referred to as standard shortening is often added an emulsifier such as monoglyceride to aid in the formation of good emulsions, particularly in cake batters. The characteristics of the base oil, plasticizer and emulsifier varies as does the percentage of each depending upon the source of the original oils and also upon the desired end use of the shortening. The formulation of shortening is not a new art. Cottonseed oil has long been a preferred ingredient for use in making base oils, and plasticizers, and as a result, has maintained an average higher cost price than most other ingredient fats and oils. Some of the scientific reasons for the plus values of cottonseed oil have become apparent in the studies which have resulted in the material contained in this disclosure.

Shortening may be plasticized with a certain amount of 60 titer hard fat or a larger quantity of 50 titer hard fat, for example. The type of hard fat added has a marked effect upon the appearance and crystal stability of the shortening. Cottonseed oil hardened to substantially complete saturation (about 60° C. titer) is a preferred plasticizing agent. Hard fat prepared from peanut oil is less desirable, and hard fats prepared from soybean oil or lard are even less desirable. X-ray diffraction photographs of the four hard fats mentioned above indicate that only cottonseed oil hard fat is stable in its beta prime crystalline form. The other three have as their stable crystal form the beta type crystal. Here then in the X-ray studies is a scientific physical test which demonstrates a difference between cottonseed oil and other common oils. Although this difference was discerned by earlier workers, they apparently did not realize the import or the reason for the superiority of cottonseed oil.

One explanation of the differences between the fully hardened fats used as plasticizers may be obtained by examining the X-ray crystal patterns of these fats. A more comprehensive description of the techniques of studying X-ray crystal patterns and interpreting them may be had by consulting Ferguson and Fulton, Chem. Rev., 29, 355 (1941); Lutton, J. A. C. S., 67, 524 (1945); and Mitchel, U. S. Patents Nos. 2,521,242 and 2,521,243. Simply stated:

If a powdered sample of any one of the substantially fully hydrogenated fats is mounted in such a manner that X-rays passing through it are refracted onto a circular screen, the refracted light will concentrate in bands. By measuring these bands, it is possible to calculate the spacing between molecules of the fat. Most, but not all, fats have three melting points and they correspond to three different packings of molecules as shown by X-ray studies.

The lowest melting form of a fat can be recognized by a single line in the X-ray picture. This is the so-called alpha melting form—the single line on the X-ray picture demonstating about 4.1 Angstroms distance between adjacent molecules. The intermediate melting form shows two lines on the X-ray picture and is called beta prime form. The two lines showing packing between adjacent molecules of two different distances of about 4.2 and 3.8 Angstroms.

The highest melting and most stable form of most fats produces three lines in an X-ray photograph and is known as the beta melting form. Studies show that the adjacent molecules are packed at three different distances of about 4.6, 3.8 and 3.7 Angstrom units.

X-ray diffraction photographs of the four hard fats mentioned earlier indicate that only cottonseed oil hard fat crystallizes in the beta-prime form as its most stable melting form. The other three, namely, peanut, soybean and lard hard fat, are most stable in their beta melting form. And whereas it is impossible to crystallize cottonseed oil in the beta form, it is also almost impossible to crystallize hardened lard in the beta prime melting form.

It will be an important teaching of the process of this invention that a beta prime stable fat is created from a combination of two fats, each of which crystallizes in the beta configuration in their most stable melting forms.

An unusual characteristic of substantially fully hydrogenated cottonseed oil which can easily be demonstrated is that resulting from very slowly cooling the liquid fat. Hardened cottonseed oil tends to shrink away from its container whereas hardened lard, soybean oil and peanut oil tend to erupt.

It is probably this tendency of hardened cottonseed oil not to erupt upon cooling which makes it so desirable as a plasticizing agent in shortening, particularly in maintaining the desirable surface sheen which makes shortenings plasticized with substantially fully hydrogenated cottonseed oil so attractive to the eye. Whereas erupting plasticizers spoil the appearance of a shortening upon aging, hardened cottonseed oil plasticizer retains the initial desirable appearance even after "tempering."

The observations of slowly cooled substantially fully hydrogenated fat studied herein have led to an easy method of studying hard fats. About 200 grams of the melted fat contained in a 300 ml. stainless steel beaker are slowly cooled in an oven held at just below the melting point of the fat being studied. Fats which erupt on very slow cooling are beta stable (X-ray wise) and fats maintaining a relatively smooth surface while shrinking from the sides of the container are beta prime stable.

In general, the triglyceride compositions of the present invention comprise the interesterification product of a mixture of fats wherein the C_{16} acids comprise 20–27% of the total C_{16} and C_{18} acids, the C_{18} acids comprise 73–80% of the total C_{16} and C_{18} acids, and the total C_{16} and C_{18} acids of the mixture are more than 95% of the total acids. The iodine value of the reactants is of minor significance because the interesterified product can be hardened to the desired point by hydrogenation, or the fats may be hydrogenated prior to interesterification. The conditions of interesterification are such that a random redistribution of the fatty acyl radicals of the glyceryl esters of the mixture is attained by treatment in the presence of an alkaline interesterification catalyst while maintaining the reactants in the liquid phase. The alkaline interesterification catalysts include metallic sodium; sodium-potassium amalgam; alkali alcoholates, such as sodium

methoxide, sodium ethoxide, and potassium ethoxide; sodium azide; and sodium hydride.

More specifically, the process comprises heating the mixture of fats to temperatures between 50° C. and 150° C. to liquefy the mixture and mixing in 0.1–5.0% by weight of the alakaline catalyst. Agitation of the mixture is continued until the random redistribution of the fatty acyl radicals is complete. The reaction in some cases is complete in 15–20 minutes, but allowance of about one hour of reaction time is recommended to further assure complete rearrangement. The reaction is stopped by adding water to kill the catalyst, and the foots are removed. The product is then hydrogenated and/or deodorized, if desired.

In order to achieve the desired product, one fat of the mixture must be higher in percent C_{16} acids than the figure selected for the final C_{16} acid content of the interesterified mixture (between 20% and 27% C_{16} acids of the total C_{16} and C_{18} acids), and the other fat should be higher in percent C_{18} acids than the figure selected for the final C_{18} acid content of the interesterified mixture (between 73% and 80% of the total C_{16} and C_{18} acids). A second criterion for both fats is that they consist predominantly of C_{16} and C_{18} acids. Fats which are high in C_{16} acids and consist predominantly of C_{16} and C_{18} acids include lard, palm oil, stearine portions thereof, and cottonseed oil stearine. Fats which are high in C_{18} acids and consist predominantly of C_{16} and C_{18} acids include soybean oil, peanut oil, olive oil, sunflower oil, sesame oil, corn oil, linseed oil, and safflower oil.

Examples of specific interesterified, randomly redistributed mixtures within the scope of the instant invention follow. They are by no means exhaustive of the combinations of fats within the scope of the present invention and hence should not be construed as placing any limitation on the invention as defined in the appended claims. Analyses of the acid content of each fat is provided because the acid content of any individual fat is subject to some variance from batch to batch.

Example I

	Percent
Lard	65
C_{16} acids, percent	31.0
C_{18} acids, do	65.4
Other acids, do	3.2
Soybean oil	35
C_{16} acids, percent	10.2
C_{18} acids, do	88.5
Other acids, do	1.3

Example II

	Percent
Palm oil	67
C_{16} acids, percent	32.3
C_{18} acids, do	66.1
Other acids, do	1.6
Olive oil	33
C_{16} acids, percent	6.9
C_{18} acids, do	91.3
Other acids, do	0.1

Example III

	Percent
Palm oil	40
C_{16} acids, percent	45.9
C_{18} acids, do	53.0
Other acids, do	1.1
Corn oil	60
C_{16} acids, percent	12.6
C_{18} acids, do	85.7
Other acids, do	1.7

Example IV

	Percent
Lard	71
C_{16} acids, percent	31.0
C_{18} acids, do	65.4
Other acids, do	3.6
Safflower oil	29
C_{16} acids, percent	2.9
C_{18} acids, do	95.1
Other acids, do	2.0

Example V

	Percent
Lard	90
C_{16} acids, percent	29.2
C_{18} acids, do	67.6
Other acids, do	3.2
Sunflower oil	10
C_{16} acids, percent	3.6
C_{18} acids, do	95.4
Other acids, do	1.0

The resultant beta prime crystal pattern of the products of this invention and other physical characteristics make them eminently suitable as ingredients of shortenings and margarines. They may be used as the base oil of plastic shortenings (blended or all-hydrogenated types); or in liquid shortenings; or as the hard fat plasticizer of a plastic blended shortening. When used as the base oil, the interesterified product may be partially hydrogenated to any desired degree of hardness or may be used without hydrogenation. In preparation of a hard fat, the triglycerides are hydrogenated either before or after interesterification to give a final product with a titer of at least 50° C., preferably about 60° C. For a more detailed discussion of shortenings, see A. E. Bailey, Industrial Oil and Fat Products, 2nd edition, Interscience Publishers, New York, New York, 1951, pp. 234–257.

The basic ingredients of plastic shortenings containing products of this invention comprise 80–98% animal and/or vegetable triglyceride soft fats, unhydrogenated, partially hydrogenated, or a blend of partially hydrogenated and unhydrogenated fats; and 2–20% highly hydrogenated animal or vegetable fat, at least 50° C. titer. An emulsifier is often added in amounts between 2% and 10%, usually 6–8% of the finished shortening, to improve dispersion of the fat in bakers' doughs. A mixture of mono- and diglycerides is most commonly employed as the emulsifier, but others can be used. Minor amounts of antioxidants and stabilizers such as gum guaiac, nordihydroguaiaretic acid, propyl gallate, thiodipropionic acid or its higher alkyl esters, butylated hydroxyanisole, lecithin, citric acid, and phosphoric acid are usually included in the formulation.

The shortenings may be made entirely of the unhydrogenated, partially hydrogenated, and fully hydrogenated products of this invention; either one of the base oil or the hard fat may comprise such products; or said products may be blended with other soft oils such as partially hardened or unhardened cottonseed oil or partially hardened or unhardened soybean oil to give a base oil of the desired degree of hardness. In general, interesterification in the liquid phase with an alkaline catalyst of any given fully hydrogenated vegetable or animal fat mixture improves, by comparison with the uninteresterified fat, the crystal habits of the fat insofar as they affect the smooth, shiny appearance of the finished shortening. The same is true to an even more marked extent for hard fats made from the interesterified mixtures of this invention. Thus, various compositions containing said products include:

Example VI

	Percent
Partially hydrogenated interesterified fat mixture, iodine value 65–80	95–98
Fully hardened interesterified fat	2–5

Example VII

Partially hydrogenated interesterified fat mixture, iodine value 65–80	95–98
Fully hardened cottonseed oil	2–5

Example VIII

Partially hardened cottonseed oil, iodine value 65–80	95–98
Fully hardened interesterified mixture	2–5

Example IX

Mixture of partially hardened soybean oil and unhydrogenated interesterified mixture, iodine value of total mixture 65–80	95–98
Fully hardened cottonseed oil	2–5

Example X

Molecularly rearranged lard	80–98
Fully hardened interesterified mixture	2–20

Example XI

Unhydrogenated interesterified mixture	80–95
Fully hardened interesterified mixture	5–20

Example XII

Partially hydrogenated soybean oil, iodine value 35–50	30–45
Unhydrogenated cottonseed oil	50–65
Fully hardened interesterified mixture	2–5

The foregoing shortening compositions of Examples VI to XII may contain, in addition to the triglyceride mixtures specified, emulsifiers, antioxidants, and stabilizers of the types and proportions previously indicated.

The "interesterified mixture" in the foregoing examples is a randomly redistributed triglyceride mixture of at least two fats, the mixture containing 20–27% C_{16} acids and 73–80% C_{18} acids in the total C_{16} and C_{18} acids, and not greater than 5% of acids other than C_{16} and C_{18} acids as previously described herein and as typified in Examples I–V. Molecularly rearranged lard is lard heated in the liquid phase in the presence of an alkaline interesterification catalyst under the procedures outlined in U. S. Patent Nos. 2,571,315 and 2,625,478–87 to randomly redistribute the fatty acyl radicals of the lard.

The utility of the products of the instant invention as ingredients in shortenings may be further understood from the following examples.

Example XIII

Sixty percent of lard having a softening point of 85° F., melting point of 112° F., cloud point of 82° F. and iodine number 67.0 was interesterified with 40% soybean oil having a cloud point of 22° F. and iodine number 134.1 by heating the mixture with 1% sodium methoxide at 100° C. Samples taken at intervals and analyzed showed that interesterification was more or less complete at the end of 15 minutes. The following table is a summary of the characteristics of the samples taken at varying intervals.

Minutes	Melting Point, ° F.	Cloud Point, ° F.	Iodine No.
0	108	70	93.6
16	96	68	
40	94	70	
60	93	72	
80	94	70	92.8

The final interesterified mixture was hardened with 0.2% Rufert nickel catalyst at 30 lbs. hydrogen pressure and

200° C. Samples were taken during the hardening and analyzed as follows:

Refractive Index	Melting Point, ° F.	Iodine No.	Titer, ° C.
43.3	94	92.0	33.6
37.8	104	60.9	38.7
33.4	130	28.6	55.7
30.5	146	5.2	62.4

After cooling, the final hardened sample shrunk from the sides of the container in a manner similar to 60 titer hardened cottonseed oil. An examination of the X-ray pictures of the samples showed that it had crystallized in the desirable beta prime crystal form, the same form as cottonseed oil.

It is thus apparent from the foregoing example that a fully hardened interesterification mixture of 60% lard and 40% soybean oil behaves like a fully hardened cottonseed oil. In order to further investigate the characteristics of the foregoing mixture, a shortening was made using interesterified mixture of 60% lard and 40% soybean oil, the base oil of the shortening being partially hardened and the plasticizer being fully hardened. Results are reported in the following examples.

Example XIV

Using the data previously accumulated, a mixture of 60% lard and 40% soybean oil was interesterified in a liquid phase for one hour at 100° C. with 1% sodium methylate as catalyst. The interesterified mixture was refined and bleached. It was then partially hardened using 0.2% Rufert nickel catalyst at 30 lbs. hydrogen pressure and 200° C. Analyses of the samples were:

Sample No.	Softening Point, ° F.	Melting Point, ° F.	Iodine No.	Special Analyses			
				lin.	l'len.	arach.	conj. D. B.
				Percent	*Percent*	*Percent*	*Percent*
1	73	91	89.9	20.5	2.3	0.26	3.2
2	84	94	76.0	12.7	0.9	0.04	0.37

Sample No. 1 was an unhydrogenated, interesterified mixture of a 60:40 mixture of lard and soybean oil. Sample No. 2 was the same interesterified mixture hardened from a refractive index of 42.6 to 40.0.

A shortening was formulated from the partially hardened interesterified mixture immediately preceding and of the characteristics indicated in the above table and 10% of the 62.4° C. titer hard fat of Example XIII. The mixture was chilled, and the shortening submitted for a baking test.

A pound cake was prepared with the synthetic triglyceride oil shortening. After baking, the pound cake had a specific gravity of 0.750 and a volume of 1390 cc. The shortening had a wet cream specific gravity of 0.665.

Example XV

A second similar interesterified composition of a 60:40 lard-soybean oil mixture was prepared, and the base oil was partially hardened from a refractive index of 42.5 to 40.2. Analysis before (No. 1) and after (No. 2) partial hardening were:

Sample No.	Softening Point, ° F.	Melting Point, ° F.	Iodine No.	Special Analyses			
				lin.	l'len.	arach.	conj. D. B.
				Percent	*Percent*	*Percent*	*Percent*
1	(1)	(1)	90.0	25.7	3.3	2.5	0.37
2	84	93	78.7	15.3	0.72	0.07	0.37

[1] Too soft.

A fully hydrogenated sample was prepared from a like interesterified mixture. Analyses of samples taken before (No. 3), during (No. 4), and after (No. 5) fully hydrogenating the mixture were:

Sample No.	Ref. Index	Soft. Pt., ° F.	Melt. Pt., ° F.	Iod. No.	Cloud Pt., ° F.	Titer, ° C.
3	43.1	77	97	93.5	64	33.2
4	39.5	96	102	71.5	78	36.2
5	30.4	148	150	2.3	-------	63.1

A sample of a blend of 85% of the partially hardened interesterified base oil and 15% of the fully hardened interesterified product was chilled, and the performance of the shortening in a pound cake was observed. The pound cake had a specific gravity of 0.740 and a 1485 cc. volume. Wet cream specific gravity was 0.850. Other constants of the shortening blend were: softening point, 125° F.; melting point, 131° F.; and iodine number, 67.1.

The pound cake baking test is commonly used as a means to evaluate the baking properties of a shortening. The test employed in the foregoing examples is described in U. S. Patent No. 2,625,478.

The interesterified fats of this invention may be used as an ingredient of margarine. Margarine, sometimes referred to as oleomargarine and baker's margarine, is a water-in-oil emulsion formed by combining milk fluids with an edible, soft triglyceride fat by churning, followed by chilling, to produce a solidified plastic product. A few tenths of one percent of an emulsifying agent such as vegetable lecithin, mono- and diglycerides, and sodium monostearin sulfoacetate is generally included to stabilize the emulsion against separating. For a more detailed discussion of margarine and its method of manufacture, reference is made to the A. E. Bailey, text, supra, pp. 272–291.

This aspect of the invention may be further understood from the following examples.

Example XVI

1620 pounds of P. S. lard and 1080 pounds of soybean oil were dried to a moisure content of 0.027%. The mixture was heated to 212° F. and while being agitated, 10 pounds of sodium methylate was added. Agitation and temperature was maintained for one hour after which time the temperature was reduced to 135° F. After two hours, about 150 pounds of water was added to neutralize the catalyst and hydrate the soaps which were removed by settling, followed by a water wash with 300 pounds of water and a light bleach with diatomaceous earth.

The fat was then hydrogenated to an iodine value of 64.7. The oil had an FAC softening point of 93° F., an FAC melting point of 104° F., which constants very closely resemble those of cottonseed oil hydrogenated to the same iodine value. After deodorizing, the fat was made into margarine, which had desirable plastic properties at refrigeration, room, and body temperatures, and good "get away" in the mouth.

Thus, a margarine prepared with the interesterified fats of this invention would contain the following basic ingredients.

Example XVII

	Percent
Interesterified fat	[1] At least 80
Milk, skim or whole	14–18
Emulsifying agent	0.1–1.0
Salt	2.25–4.0

[1] Minimum fat under present federal standards.

Other minor ingredients may include preservatives such as sodium benzoate, vitamin concentrates, artificial coloring, and butter flavoring compositions.

Also, the interesterified mixtures may be blended with other natural fats and fractions thereof such as cottonseed oil, soybean oil, neutral lard, molecularly rearranged lard, peanut oil, oleo oil, oleostearine, corn oil, coconut oil, whale oil, and oleo stock in the manufacture of margarine. Said interesterified mixtures are excellent substitutes for cottonseed oil, soybean oil, and peanut oil as margarine ingredients and may be blended therewith in any desired proportion. The other fats mentioned above are employed in lesser amounts than the interesterified fats in the most desirable margarine products.

The infrared absorption spectrum curves in the area from 13.75 to 13.90 microns (or light frequencies of 727 to 710 cm.$^{-1}$) for fully hydrogenated cottonseed oil, fully hydrogenated lard, fully hydrogenated soybean, oil, and a fully hydrogenated interesterified 60:40 lard-soybean oil mixture provide additional information relative to the comparative physical characteristics of these fats. The spectrum curve for hydrogenated cottonseed oil had twin peaks at 13.75 and 13.91 microns; hydrogenated soybean oil had twin peaks dissimilar to the peaks of hydrogenated cottonseed oil at the same wave lengths; hydrogenated lard had only a single peak at 13.96 microns; and the hydrogenated interesterified mixture of lard and soybean oil had twin peaks very similar to the peaks of hydrogenated cottonseed oil at 13.75 and 13.91 microns. The techniques involved in the above study are described in Application of infra-red spectrometry to fatty acid derivatives, by R. T. O'Connor, 32 Jour. Am. Oil Chem. Soc., 1–15 (1956).

Obviously many modifications and variations of the invention hereinbefore set forth may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. A synthetic triglyceride fat which comprises an interesterified mixture of at least two fatty triglyceride compositions, each of said fatty triglyceride compositions having a substantially stable beta crystal structure, said mixture containing fatty acyl components approximating 73–80% C_{18} acids and 20–27% C_{16} acids of the total C_{16} and C_{18} acids, the C_{16} and C_{18} acids comprising at least 95% of the total acids, the fatty acyl radicals being randomly redistributed between the glyceryl radicals of the mixture.

2. A synthetic triglyceride fat which comprises an interesterified mixture of at least two fatty triglyceride compositions, each of said fatty triglyceride compositions having a substantially stable beta crystal structure, said mixture containing fatty acyl components comprising 73–80% C_{18} acids and 20–27% C_{16} acids of the total C_{16} and C_{18} acids, the C_{16} and C_{18} acids comprising at least 95% of the acyl components, the fatty acyl radicals being randomly redistributed between the glyceryl radicals of the mixture, the crystals of said interesterified product having a beta prime crystal X-ray diffraction pattern.

3. A synthetic hard fat which comprises a hydrogenated, interesterified mixture of at least two fatty triglyceride compositions, each of said fatty triglyceride compositions having a substantially stable beta crystal structure, said mixture containing fatty acyl components comprising 73–80% C_{18} acids and 20–27% C_{16} acids of the total C_{16} and C_{18} acids, the C_{16} and C_{18} acids comprising at least 95% of the acyl components, the fatty acyl radicals being randomly redistributed between the glyceryl radicals of the mixture, said hard fat having a beta prime crystal X-ray diffraction pattern and a titer of at least about 50° C.

4. A synthetic triglyceride fat which comprises an interesterified mixture of at least one fat high in C_{16} acid content from the group consisting of lard, palm oil, stearine portions thereof, and cottonseed oil stearine and at least one fat high in C_{18} content from the group consisting of soybean oil, peanut oil, olive oil, sunflower oil, sesame oil, corn oil, linseed oil, and safflower oil, said fats being present in a ratio such that the C_{16} acids comprise 20–27% of the total C_{16} and C_{18} acids and the C_{18}

acids comprise 73–80% of the total C_{16} and C_{18} acids, the fatty acyl radicals being randomly redistributed between the glyceryl radicals of the mixture.

5. A synthetic hard fat which comprises a hydrogenated interesterified mixture of at least one fat high in C_{16} acid content from the group consisting of lard, palm oil, stearine portions thereof, and cottonseed oil stearine and at least one fat high in C_{18} content from the group consisting of soybean oil, peanut oil, olive oil, sunflower oil, sesame oil, corn oil, linseed oil, and safflower oil, said fats being present in a ratio such that the C_{16} acids comprise 20–27% of the total C_{16} and C_{18} acids and the C_{18} acids comprise 73–80% of the total C_{16} and C_{18} acids, the fatty acyl radicals being randomly redistributed between the glyceryl radicals of the mixture, said hydrogenated interesterified mixture having a titer of at least 50° C.

6. A synthetic triglyceride fat which comprises the interesterified mixture of lard and soybean oil, said lard and soybean oil being present in a ratio such that the total C_{16} acids comprise 20–27% of the total C_{16} and C_{18} acids, the fatty acyl radicals of said mixture being randomly redistributed between the glyceryl radicals of said mixture.

7. A synthetic hard fat which comprises the interesterified mixture of lard and soybean oil, said lard and soybean oil being present in a ratio such that the total C_{16} acids comprise 20–27% of the total C_{16} and C_{18} acids, the fatty acyl radicals of said mixture being randomly redistributed between the glyceryl radicals of said mixture, said interesterified mixture having a titer of at least 50° C. and a beta prime crystal X-ray diffraction pattern.

8. A plastic shortening which comprises a blend of soft fat and hard fat, said hard fat comprising a hydrogenated, interesterified mixture of at least two fatty triglyceride compositions, each of said fatty triglyceride compositions having a substantially stable beta crystal structure, said mixture containing fatty acyl components comprising 73–80% C_{18} acids and 20–27% C_{16} acids of the total C_{16} and C_{18} acids, the C_{16} and C_{18} acids comprising at least 95% of the acyl components, the fatty acyl radicals being randomly redistributed between the glyceryl radicals of the mixture, said hard fat having a beta prime crystal X-ray diffraction pattern and a titer of at least about 50° C.

9. A plastic shortening which comprises a blend of soft fat and hard fat, said hard fat comprising the interesterified mixture of lard and soybean oil, said lard and soybean oil being present in a ratio such that the total C_{16} acids comprise 20–27% of the total C_{16} and C_{18} acids, the fatty acyl radicals of said mixture being randomly redistributed between the glyceryl radicals of said mixture, said interesterified mixture having a titer of at least 50° C. and a beta prime crystal X-ray diffraction pattern.

10. A margarine which comprises a water-in-oil emulsion of a composition comprising at least about 80% triglyceride fat, 14–18% milk, and small amounts of salt and an emulsifying agent, said triglyceride fat comprising an interesterified mixture of at least two fatty triglyceride compositions, each of said fatty triglyceride compositions having a substantially stable beta crystal structure, said mixture containing fatty acyl components approximately 73–80% C_{18} acids and 20–27% C_{16} acids of the total C_{16} and C_{18} acids, the C_{16} and C_{18} acids comprising at least 95% of the total acids, the fatty acyl radicals being randomly redistributed between the glyceryl radicals of the mixture.

11. A margarine which comprises a water-in oil emulsion of a composition comprising at least about 80% triglyceride fat, 14–18% milk, and small amounts of salt and an emulsifying agent, said triglyceride fat comprising an interesterified mixture of at least one fat high in C_{16} acid content from the group consisting of lard, palm oil, stearine portions thereof, and cottonseed oil stearine and at least one fat high in C_{18} content from the group consisting of soybean oil, peanut oil, olive oil, sunflower oil, sesame oil, corn oil, linseed oil, and safflower oil, said fats being present in a ratio such that the C_{16} acids comprise 20–27% of the total C_{16} and C_{18} acids and the C_{18} acids comprise 73–80% of the total C_{16} and C_{18} acids, the fatty acyl radicals being randomly redistributed between the glyceryl radicals of the mixture.

12. A margarine which comprises a water-in-oil emulsion of a composition comprising at least about 80% interesterified triglyceride fat, 14–18% milk, and small amounts of salt and an emulsifying agent, said triglyceride fat comprising the interesterified mixture of lard and soybean oil, said lard and soybean oil being present in a ratio such that the total C_{16} acids comprise 20–27% of the total C_{16} and C_{18} acids, the fatty acyl radicals of said mixture being randomly redistributed between the glyceryl radicals of said mixture.

13. A method of preparing a synthetic triglyceride fat which comprises mixing at least two fatty triglyceride compositions, each of said fatty triglyceride compositions having a substantially stable beta crystal structure, the mixture of said fatty triglyceride compositions containing fatty acyl components comprising approximately 73–80% C_{18} and 20–27% C_{16} acids of the total C_{16} and C_{18} acids, the C_{16} and C_{18} acids comprising at least 95% of the total acids; and thereafter heating the mixture of fatty triglyceride compositions to at least about 50° C. in the presence of an alkaline catalyst so as to randomly redistribute the acyl radicals of said fatty triglyceride compositions.

14. A method of preparing a synthetic triglyceride fat which comprises mixing at least two fatty triglyceride compositions, each of said fatty triglyceride compositions having a substantially stable beta crystal structure, the mixture of said fatty triglyceride compositions containing fatty acyl components comprising approximately 73–80% C_{18} and 20–27% C_{16} acids of the total C_{16} and C_{18} acids, the C_{16} and C_{18} acids comprising at least 95% of the total acids, at least one of the fatty triglyceride compositions having a high C_{16} acid content, said composition being selected from the group consisting of lard, palm oil, stearine portions thereof, and cottonseed oil stearine, and at least one fatty triglyceride composition having a high C_{18} content, which composition is selected from the group consisting of soybean oil, peanut oil, olive oil, sunflower oil, sesame oil, corn oil, linseed oil and safflower oil; and thereafter heating the mixture of fatty triglyceride compositions to at least about 50° C. in the presence of an alkaline catalyst so as to randomly redistribute the acyl radicals of said fatty triglyceride compositions.

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