and other electrical devices. These electrical devices include power and distribution transformers, circuit breakers, capacitors, switchgear, X-ray machines and insulating cables.

[0008] Bio-based oil, particularly high-oleic acid soybean oil, has been used as a dielectric fluid in sealed transformers since the 1990s (see Srivastava (2009) *Int'l J Computer Electrical Eng*, v. 1(2) pp. 212-216). Current bio-based dielectric fluids are purified, high-oleic triacylglycerols (TAGs) with incorporated additives (see US Patent No. 6,274,067 and US Patent App. Nos 20100243969 and 20080283803). For example, the primary benefits of high-oleic acid soybean oil dielectric fluid versus mineral oil-based dielectric fluid are (i) an increased fire point (2x), (ii) an increased transformer life (4-8x), and (iii) a lower cost of remediating spills due to bio-based oil's high biodegradability (>3x) and lower toxicity (see Schneider (2006) *J Sci Food Agric,* v. 86 pp:1769-1780).

[0009] The primary disadvantages of bio-based oils over mineral-based oils are the oxidative instability of bio-based oils, the increased cost of procuring bio-based oils and transitioning equipment from mineral-based oils to bio-based oils see Schneider (2006), supra). Although bio-based dielectric fluids occupy a significant portion of the dielectric fluid market, mineral-oil based dielectric fluids currently dominate the market. Another significant disadvantage is the cost of production of these soy-based oils and their diversion of an important food source into non-food applications.

SUMMARY

[0010] In certain embodiments, the present invention provides microbial oils with improved pour point, methods for making such oils, and products derived from them. Pour point is a function of relative concentrations of saturated to unsaturated fatty acids of the triglyceride oil and the the chain length of the fatty acids.

[0010a] Thus, in a first aspect, the present invention refers to a product comprising microbial oil, wherein the oil has a pour point of less than about -5° C, and wherein the fatty acid composition of the microbial oil is at least 50 area % C18:1 fatty acids and less than 2 area % C18:2 fatty acids, as determined by fatty acid methyl ester gas chromatography flame ionization detection methods.

[0010b] Thus, in a second aspect, the present invention refers to a dielectric fluid comprising microbial oil produced by a genetically engineered microbe, wherein the dielectric fluid has a pour point of about -10° C or lower, and wherein the fatty acid composition of the microbial oil is at least 50 area % C18:1 fatty acids and less than 2 area % C18:2 fatty acids, as determined by fatty acid methyl ester gas chromatography flame ionization detection methods.

[0010c] Thus, in a third aspect, the present invention refers to an electrical component comprising the dielectric fluid of the present invention.

[0010d] In ~~embodiments~~examples of the methods described herein~~of the invention~~, the initial pour point of microbial oil is reduced by reducing the relative proportion of the saturated fraction, including palmitic and stearic triglycerides known as the stearin fraction. In accordance with these methods, the oil is fractionated to reduce the saturated triglycerides concentration of the oil. This can be accomplished in accordance with examples described herein~~embodiments of the invention~~ by dry fractionation, an illustrative process for carrying out "winterization". In one ~~embodiment~~example of this method, microbial (e.g., algal) oil is optionally first refined, bleached, deodorized or degummed to produce "RBD oil," which is characterized by an initial pour point. The temperature of the RBD oil is then lowered in a controlled manner until crystal nuclei are formed and then held at that first crystallization temperature (i.e., for several hours) to produce crystals. The crystals are then removed by filtration to produce two fractions: a solid phase containing some or most of the stearin

fraction, and a liquid phase containing mostly the olein fraction. This liquid phase is characterized by a second pour point that is lower than the initial pour point, e.g, the second pour point can be between about -10° C and about -40° C, and the fatty acid composition of the can be at least 50% C18:1 and less than 10% C18:2. The liquid phase can be subjected to fractionation again to a second, lower crystallization temperature to effect a further removal of stearin. In illustrative ~~embodiments~~examples, the first crystallization temperature is between above 15° C to about 50° C, and the second crystallization temperature is between about -15° C and about 15° C.

[0011] In any event, the resulting purified liquid fraction, is equivalent to or substantially similarly to a super olein oil as commonly known in the vegetable oil industry, has better thermal properties than the native algal oil. In some embodiments, the properties are further improved by the addition of a chemical pour point depressant that reduces the pour point even further, as may be desired for specific applications. The microbial oil provided by this method can be used not only in food applications, but also in industrial applications, such as the production of lubricants, hydraulic fluids, industrical oils and dielectric fluids. For industrial applications (e.g., dielectric fluids), one or more additives that can be added to the microbial oil (in addition to, or instead of, a pour point depressant) include: an antioxidant, metal ion deactivator, corrosion inhibitor, demulsifier, anti-wear additive or anti-hydrolysis compound.

[0012] In various ~~embodiments~~examples, the microbial oil is derived from oleaginous microbes, such as microalgal cells, having distinct lipid profiles (i.e., distinct fatty acid profiles), including recombinant cells expressing exogenous genes encoding proteins such as one or more fatty acyl-ACP thioesterases. In illustrative ~~embodiments~~examples, the microbial oil is derived from a genetically engineered microbe engineered to express one or more exogenous genes, and the method additionally includes cultivating the microbe until the microbe has at least 10% oil by dry weight, and separating the oil from the microbe to produce a microbial oil that can then be refined, bleached, deodorized and optionally degummed, as described above. Other oleaginous microbes, including yeast, fungi, and bacteria, with similar or distinct lipid profiles can also be employed. In certain ~~embodiments~~examples, the present ~~invention~~disclosure thus provides methods of making lipids and oil-based products, including dielectric fluids, from such microalgal and/or oleaginous microbes, including yeast, fungi and bacteria.

[0013] In certain ~~embodiments~~examples, the ~~invention~~disclosure provides a product including a microbial oil, wherein the microbial oil has a pour point of between about 10° C and about -40° C, and wherein the fatty acid composition of the microbial oil is at least about 50% C18:1 and less

than about 10% C18:2. In variations of such ~~embodiments~~examples, the product has a pour point of between -10° C and about -40° C. The microbial oil in the product can include, for example, include at least about 60%, at least about 70%, or at least about 80% C18:1. In some cases, the microbial oil can include less than about 5% C18:2 (e.g., is at least about 80% C18:1 and less than about 5% C18:2). In particular ~~embodiments~~examples, the microbial oild in the product has an iodine value between about 25 and about 200. The microbial oil can, in certain ~~embodiments~~examples, be produced by a genetically engineered microbe engineered to express one or more exogenous genes. Illustrative microbes for this purpose include species from the genus *Prototheca* or *Chlorella*. (*e.g., Prototheca moriformis*). Such microbes can be engineered to express, for example, one or more exogenous genes encoding sucrose invertase and/or fatty acyl-ACP thioesterase. In illustrative ~~embodiments~~examples, a microbe is engineered to express exogenous genes encoding two or more fatty acyl-ACP thioesterases or sucrose invertase and one or more fatty acyl-ACP thioesterases.

[0014] In various ~~embodiments~~examples, the product includes one or more additive(s), such as an antioxidant, a metal ion deactivator, a corrosion inhibitor, a demulsifier, an anti-wear additive, a pour point depressant, or an anti-hydrolysis compound. Illustrative products include a lubricant, a hydraulic fluid, an industrial oil, or a dielectric fluid. Dielectic fluids, in particular, can have one or more of the above-discussed additives.

[0015] In some cases, the microbial oil-based product is a dielectric fluid. In some ~~embodiments~~examples, the microbial oil used in the dielectric fluid has one or more of the following attributes: (i) less than 0.4 micrograms/ml total carotenoids; (ii) less than 0.001 micrograms/ml lycopene; (iii) less than 0.02 micrograms/ml beta carotene; (iv) less than 0.02 milligrams of chlorophyll per kilogram of oil; (v) 0.40-0.60 milligrams of gamma tocopherol per 100 grams of oil; (vi) 3-9 mg campesterol per 100 grams of oil; or (vii) less than 0.5 milligrams of total tocotrienols per gram of oil. In some cases, the dielectric fluid has one or more of the following properties: viscosity at 40°C of less than about 110 cSt, e.g., in the range of 20-30 cSt; (b) viscosity at 100°C in the range of about 2 to about 15 cSt, e.g., 4-8 cSt; (c) a viscosity index (VI, a unitless number) at 40°C of at least 35, including but not limited to a VI of 35 to 80, a VI of 80 to 110, a VIT of 110 to 125, a VI of 125 to 160, and, in some ~~embodiments~~examples a VI of greater than 160; (d) a pour point (the lowest temperature at which the liquid will flow) of -8 to 10°C or lower, including but not limited to a pour point of -20 to -25°C or lower, and, in some ~~embodiments~~examples, a pour point of -30°C, or-40°C or lower; (e) lubricity equivalent to ASTM D2882; (f) low volatility; (g) a high flash point, including a flash point of 150°C or higher, including a flash point of 300°C or higher; (h) a fire point of

150°C or higher (e.g., above 300°C), including a flash point of 300°C or higher; (i) low reactivity, including resistance to decomposition in the presence of acids and bases, good thermal stability, low susceptibility to reaction with oxygen, and a low neutralization number (0.06 or lower, for example 0.03 or lower); (j) good miscibility, including high demulsibility; (k) a power factor at 25°C of 1% or lower, including but not limited to 0.5% or lower, 0.15% or lower, 0.1% or lower, and, in some ~~embodiments~~examples 0.05% or lower, (l) a power factor at 100°C of 1.5% or lower, including but not limited to 1% or lower, 0.3% or lower, and, in some ~~embodiments~~examples 0.1% or lower; (m) a high dielectric strength; (n) a low dissipation factor; (o) a low electrical conductivity; (p) high specific heat, including but not limited to a specific heat of at least 0.39 cal/gm/°C, and, in some ~~embodiments~~examples, a specific heat of at least 0.45 cal/gm/°C or higher; and (q) is biodegradable, i.e., breaks down into carbon dioxide and water in the presence of microbes, such that at least 15% or more of the dielectric fluid degrades under standard test conditions biodegrades in 28 days, and in some ~~embodiments~~examples, 30% or more, or 70% or more, or 100% biodegrades under these conditions.

[0016] The ~~invention~~disclosure also provides an electrical component including the above-described dielectric fluid. In certain ~~embodiments~~examples, the electrical component is a transformer.

[0017] The ~~invention~~disclosure further provides a method of producing a product including a microbial oil. In certain ~~embodiments~~examples, the product has a pour point of between about -10° C and about -40° C, and wherein the fatty acid composition of the microbial oil is at least 50% C18:1 and less than 10% C18:2. In such ~~embodiments~~examples, the method entails cultivating a genetically engineered microbe engineered to express one or more exogenous genes until the microbe has at least 10% oil by dry weight and then separating the oil from the microbe. The microbial oil is then subjected to refining, bleaching, deodorizing and, optionally, degumming to produce RBD oil. The method can, optionally, further entail adding an antioxidant, metal ion deactivator, corrosion inhibitor, demulsifier, anti-wear additive, pour point depressant, or anti-hydrolysis compound to the RBD oil. Illustrative engineered microbes for can include species from the genus *Prototheca* or *Chlorella*. (*e.g., Prototheca moriformis*). Such microbes can be engineered to express, for example, one or more exogenous genes encoding sucrose invertase and/or fatty acyl-ACP thioesterase. In illustrative ~~embodiments~~examples, a microbe is engineered to express exogenous genes encoding two or more fatty acyl-ACP thioesterases or sucrose invertase and one or more fatty acyl-ACP thioesterases.

[0018] In one ~~embodiment~~example, the present ~~invention~~disclosure provides a method of making a dielectric fluid, the method comprising the steps of: (a) cultivating an oleaginous microbe to provide an

oleaginous microbe that is at least 10% lipid by dry weight, (b) separating the lipid from the oleaginous microbe, and (c) subjecting the lipid to at least one processing step selected from the group consisting of refining, bleaching, deodorizing, degumming, and fractionating by crystallizing or dry fractionation or by winterizing.

[0019] In some specific ~~embodiments~~examples of the method, the oleaginous microbe is selected from the group consisting of microalgae, oleaginous yeast, oleaginous fungi and oleaginous bacteria. In some cases, the oleaginous microbe is an oleaginous bacteria that is *Rhodococcus opacus*. In some cases, the oleaginous microbe is an oleaginous fungi. In some cases, the oleaginous fungi is a species listed in Table 3. In some cases, the oleaginous microbe is an oleaginous yeast. In some cases, the oleaginous yeast is a species listed in Table 2. In some cases, the oleaginous microbe is a microalgae. In some cases, the microalgae is a species listed in Table 1. In some cases, the microalgae is of the genus *Prototheca*.

[0020] In some ~~embodiments~~examples, the dielectric fluid produced by the method has one or more of the following attributes: (i) 0.05-0.244 mcg/g total carotenoids; (ii) less than 0.003 mcg/g lycopene; (iii) less than 0.003 mcg/g beta carotene; (iv) 0.045-0.268 mcg/g chlorophyll A; (v) 38.3-164 mcg/g gamma tocopherol; (vi) less than 0.25% brassicasterol, campesterol, stignasterol, or beta-sitosterol; (vii) 249.6-325.3 mcg/g total tocotrienols; (viii) 0.003-0.039 mcg/g lutein; and (ix) 60.8-261.7 mcg/g tocopherols. In some ~~embodiments~~examples, the dielectric fluid produced by the method has a property selected from the group consisting of: (a) viscosity at 40°C of less than about 110 cSt, e.g., in the range of 20-30 cSt; (b) viscosity at 100°C in the range of about 2 to about 15 cSt, e.g., 4-8 cSt; (c) a viscosity index at 40°C of at least 35; (d) a pour point of -8 to -10°C or lower, including -15 to -25°C or lower; (e) lubricity equivalent to ASTM D2882; (f) a flash point of 150°C or higher; (g) a neutralization number of 0.06 or lower; (h) a power factor at 25°C of 1% or lower; (i) a specific heat of at least 0.39 cal/gm/°C; and (j) biodegradability such that at least 15% or more of the dielectric fluid degrades under standard test conditions in 28 days.

[0021] In some cases, the dielectric fluid is admixed with one or more of the following additives: (a) an antioxidant; (b) a deactivator of metal ions; (c) a corrosion inhibitor; (d) a demulsifier; (e) an anti-wear additive; (f) a malan styrene copolymer; (g) a pour point depressant, including but not limited to VISCOPLEX® 10-310 or 1-133 (Rohmax-Evonik Additives GmbH), or other poly(alkyl) acrylates and poly(methyl)acrylates such as INFINEUM® V-351 (Infineum UK limitied), PMA-D110 and PMA D; or (h) a carbodiimide; or (i) synthetic esters or (j) poly alfa olefins (PAO) or (k) ester of estolides.

[0022] In another ~~embodiment~~example, the present ~~invention~~disclosure provides a dielectric fluid comprising an oleaginous microbial oil, wherein said dielectric fluid comprises less than approximately 10% C18:2. In some cases, the dielectric fluid comprises less than approximately 5% C18:2. In some cases, the dielectric fluid comprises less than approximately 2% C18:2. In some cases, the dielectric fluid further comprises at least 65% C18:1. In some cases, the dielectric fluid further comprises less than 30% C16:0.

[0023] In some ~~embodiments~~examples, the microbial oil is blended with another oil to produce the dielectric fluid in accordance with examples disclosed herein~~embodiments of the invention~~. In some cases, the other oil is not a microbial oil. In some cases, the other oil is selected from the group consisting of soy, rapeseed, canola, palm, palm kernel, coconut, corn, waste vegetable, Chinese tallow, olive, sunflower, cottonseed, chicken fat, beef tallow, porcine tallow, microalgae, macroalgae, microbes, Cuphea, flax, peanut, choice white grease, lard, Camellina sativa, mustard seed, cashew nut, oats, lupine, kenaf, calendula, help, coffee, linseed (flax), hazelnut, euphorbia, pumpkin seed, coriander, camellia, sesame, safflower, rice, tung tree, cocoa, copra, opium poppy, castor beans, pecan, jojoba, macadamia, Brazil nuts, avocado, oleaginous yeast, oleaginous bacteria, petroleum, or a distillate fraction of any of the preceding oils.

[0024] In some ~~embodiments~~examples, the content of the other oil in the dielectric fluid is less than 30%. In some cases, the content of the other oil in the dielectric fluid is less than 20%. In some cases, the content of the other oil in the dielectric fluid is less than 10%. In some ~~embodiments~~examples, the content of the microbial oil in the dielectric fluid is less than 50%. In some cases, the content of the microbial oil in the dielectric fluid is less than 25%. In some cases, the content of the microbial oil in the dielectric fluid is less than 10%.

[0025] In another ~~embodiment~~example, the present ~~invention~~disclosure provides a dielectric fluid comprising one or more of the following additives: (a) an antioxidant, including but not limited to BHT and other phenols; (b) a deactivator of metal ions such as Cu, Zn, and the like, including but not limited to a benzotriazole; (c) corrosion inhibitors, including but not limited to ester sulfonates and succinic acid esters; (d) demulsifiers; (e) anti-wear additives, including but not limited to zinc dithiophosphate; (f) additives to depress the pour point, including but not limited to malan styrene copolymers and poly(alkyl)acrylates, including but not limited to polymethacrylates; and (g) compounds that protect against hydrolysis, including but not limited to carbodiimides.

[0026] These and other ~~embodiments~~examples of the ~~invention~~disclosure are described in the detailed description below, and are exemplified in the examples below. Any or all of the features

WHAT IS CLAIMED IS:

1. A product comprising microbial oil, wherein the oil has a pour point of less than about -5° C, and wherein the fatty acid composition of the microbial oil is at least 50% C18:1 and less than 10% C18:2.

2. The product of claim 1, wherein the product has a pour point of between about -10° C and about -40° C.

3. The product of any preceding claim, wherein the fatty acid composition of the microbial oil is at least 60% C18:1.

4. The product of any preceding claim, wherein the fatty acid composition of the microbial oil is at least 70% C18:1.

5. The product of any preceding claim, wherein the fatty acid composition of the microbial oil is less than 5% C18:2.

6. The product of any preceding claim, wherein the fatty acid composition of the microbial oil is least 80% C18:1 and less than 5% C18:2.

7. The product of any preceding claim, wherein the product has a flash point of 250° C to 375° C, or a fire point of 300° C to 450° C.

8. The product of any preceding claim, wherein the iodine value of the microbial oil is between 25 and 200.

9. The product of any preceding claim, further comprising a pour point depressant.

10. The product of any preceding claim, wherein the product is a lubricant, a hydraulic fluid, an industrial oil, or a dielectric fluid.

11. The product of any preceding claim, wherein the product is a dielectric fluid.

12. The dielectric fluid of claim 11, wherein the dielectric fluid has breakdown voltage of 20kV to 75 kV.

13. The dielectric fluid of claim 11 or claim 12, wherein the dielectric fluid has a dielectric strength of 20 MV/m (RMS) to 75MV/m (RMS).

14. The dielectric fluid of any of claims 11-13, wherein the dielectric fluid further comprises an antioxidant, a metal ion deactivator, a corrosion inhibitor, a demulsifier, an anti-wear additive, a pour point depressant, or an anti-hydrolysis compound.

15. The product of any preceding claim, wherein the microbial oil is produced by a genetically engineered microbe engineered to express one or more exogenous genes.

16. The product of claim 15, wherein the genetically engineered microbe is *Prototheca* or *Chlorella*.

17. The product of claim 16, wherein the genetically engineered microbe is *Prototheca moriformis*.

18. The product of any of claims 15-17, wherein the one or more exogenous genes encode(s) sucrose invertase or fatty acyl-ACP thioesterase.

19. The product of claim 18, wherein the one or more exogenous genes encode(s) two or more fatty acyl-ACP thioesterases.

20. The product of claim 18, wherein the one or more exogenous genes encode(s) sucrose invertase and one or more fatty acyl-ACP thioesterases.

21. A dielectric fluid comprising microbial oil produced by a genetically engineered microbe, wherein the dielectric fluid has a pour point of between about -10° C and about -40° C

22. The dielectric fluid of claim 21, wherein the fatty acid composition of the microbial oil is at least 50% C18:1 and less than 10% C18:2.

23. The dielectric fluid of of claim 21 or claim 22, wherein the fatty acid composition of the microbial oil is at least 70% C18:1.

24. The dielectric fluid of any of claims 21-23, wherein the fatty acid composition of the microbial oil is at least 70% C18:1 and less than 5% C18:2.

25. The dielectric fluid of any of claims 21-24, wherein the genetically engineered microbe is *Prototheca* or *Chlorella.*

26. The dielectric fluid of claim 25, wherein the microbe is *Prototheca moriformis.*

27. An electrical component comprising the dielectric fluid of any of claims 21-26.

28. The electrical component of claim 27 that is a transformer.

29. A method of producing an RBD microbial oil, wherein the microbial oil has a pour point of less than about -5° C, and wherein the fatty acid composition of the microbial oil is at least 50% C18:1 and less than 10% C18:2, the method comprising:

a. cultivating a genetically engineered microbe engineered to express one or more exogenous genes until the microbe has at least 10% oil by dry weight;

b. separating the oil from the microbe; and

c. subjecting the oil to refining, bleaching, deodorizing or degumming to produce RBD microbial oil.

30. The method of claim 29, wherein the microbial oil has a pour point of betweeen about -10° C and about -40° C.

31. The method of claim 29 or claim 30, wherein the method additionally comprises adding an antioxidant, metal ion deactivator, corrosion inhibitor, demulsifier, anti-wear additive, pour point depressant, or anti-hydrolysis compound to the RBD oil.

32. The method of any of claims 29-31, wherein the genetically engineered microbe is *Prototheca* or *Chlorella*.

33. The method of claim 30, wherein the genetically engineered microbe is *Prototheca moriformis*.

34. The method of any of claims 29-33, wherein the one or more exogenous genes encode(s) sucrose invertase or fatty acyl-ACP thioesterase.

35. The method of claim 34, wherein the one or more exogenous genes encode(s) two or more fatty acyl-ACP thioesterases.

36. The method of claim 34, wherein the one or more exogenous genes encode(s) sucrose invertase and one or more fatty acyl-ACP thioesterases.

37. A method of producing a product comprising microbial oil, wherein the product has a pour point of less than about -5° C, and wherein the fatty acid composition of the microbial oil is at least 50% C18:1 and less than 10% C18:2, the method comprising:

a. subjecting a first microbial oil to refining, bleaching, deodorizing or degumming to produce RBD oil, wherein the RBD oil is characterized by an initial pour point and a first temperature;

b. lowering the temperature of the RBD oil to a second temperature, which is lower than the first temperature;

c. holding the RBD oil at the second temperature; and

d. filtering the RBD oil at the second temperature to provide a second microbial oil characterized by a second pour point that is lower than the initial pour point, wherein the second pour point is less than about -5° C.

38. The method of claim 37, wherein the microbial oil has a pour point of betweeen about -10° C and about -40° C.

39. The method of claim 37 or claim 38, wherein the method additionally comprises adding an antioxidant, metal ion deactivator, corrosion inhibitor, demulsifier, anti-wear additive, pour point depressant, or anti-hydrolysis compound to the second microbial oil.

40. The method of any of claims 37-39, wherein the method additionally comprises producing the first microbial oil by:

a. cultivating a genetically engineered microbe engineered to express one or more exogenous genes until the microbe has at least 10% oil by dry weight; and

b. separating the oil from the microbe to produce the first microbial oil;

41. The method of any of claims 37-40, wherein the first temperature is between above 15° C to about 50° C, and the second temperature is between about -15° C and about 15° C.

42. The method of any of claims 37-41, wherein the product is a lubricant, a hydraulic fluid, an industrial oil, or a dielectric fluid.

43. The method of claim 42, wherein the product is a dielectric fluid.

44. The method of claim 43, wherein the dielectric fluid further comprises an antioxidant, a metal ion deactivator, a corrosion inhibitor, a demulsifier, an anti-wear additive, a pour point depressant, or an anti-hydrolysis compound.

CLAIMS

1. A product comprising microbial oil, wherein the oil has a pour point of less than about -5° C, and wherein the fatty acid composition of the microbial oil is at least 50 area % C18:1 fatty acids and less than 2 area % C18:2 fatty acids, as determined by fatty acid methyl ester gas chromatography flame ionization detection methods.

2. The product of claim 1, wherein the product has a pour point of between about -10° C and about -40° C.

3. The product of claim 1, wherein the product has a flash point of 300° C or higher.

4. The product of claim 1, further comprising a pour point depressant.

5. The product of claim 1, wherein the product is a lubricant, a hydraulic fluid, an industrial oil, or a dielectric fluid.

6. The product of claim 5, wherein the product is a dielectric fluid.

7. The product of claim 6, wherein the dielectric fluid has a breakdown voltage of 20kV to 75 kV.

8. The product of claim 6, wherein the dielectric fluid has a dielectric strength of 20 MV/m (RMS) to 75MV/m (RMS).

9. The product of claim 6, wherein the dielectric fluid further comprises an antioxidant, a metal ion deactivator, a corrosion inhibitor, a demulsifier, an anti-wear additive, a pour point depressant, or an anti-hydrolysis compound.

10. The product of claim 1, wherein the microbial oil is produced by a genetically engineered microbe engineered to express one or more exogenous genes.

11. The product of claim 10, wherein the genetically engineered microbe is *Prototheca* or *Chlorella*.

12. The product of claim 11, wherein the genetically engineered microbe is *Prototheca moriformis*.

13. The product of claims 10, wherein the one or more exogenous genes encode(s) sucrose invertase or fatty acyl-ACP thioesterase.

14. The product of claim 13, wherein the one or more exogenous genes encode(s) two or more fatty acyl-ACP thioesterases.

15. The product of claim 13, wherein the one or more exogenous genes encode(s) sucrose invertase and one or more fatty acyl-ACP thioesterases.

16. A dielectric fluid comprising microbial oil produced by a genetically engineered microbe, wherein the dielectric fluid has a pour point of about -10° C or lower, and wherein the fatty acid composition of the microbial oil is at least 50 area % C18:1 fatty acids and less than 2 area % C18:2 fatty acids, as determined by fatty acid methyl ester gas chromatography flame ionization detection methods.

17. An electrical component comprising the dielectric fluid of claim 16.

18. The electrical component of claim 17 that is a transformer.

19. The product of claim 1, wherein the oil has a pour point of -10° C or lower.

20. The product of claim 1, wherein the oil has a pour point of -20° C or lower.

21. The dielectric fluid of claim 16, wherein the dielectric fluid has a pour point of -20° C or lower.