

WHAT IS CLAIMED IS:

1. A blended fuel composition comprising

about 5 vol.% to about 95 vol.% of synthetic paraffinic diesel, wherein the synthetic paraffinic diesel comprises a hydroprocessed biorenewable feedstock, wherein the hydroprocessed biorenewable feedstock comprises a hydrotreated and hydroisomerized biorenewable feedstock, wherein the hydroprocessed biorenewable feedstock comprises a hydroprocessed product of an animal fat, animal oil, microbial oil, plant fat, plant oil, vegetable fat, vegetable oil, grease, or a mixture of any two or more thereof, and wherein the synthetic paraffinic diesel comprises by weight of the hydroprocessed biorenewable feedstock

at least 80 wt% of two or more different carbon number paraffins that fall within the C₁₁ to C₁₈ range;

less than 0.5 wt% oxygenates;

0.1 wt% to 18 wt% cycloparaffins; and

less than 1 wt % aromatics;

wherein the hydroprocessed biorenewable feedstock possesses

a density less than 0.800 kg/L;

a biodegradability of at least 40% after 23 days of exposure to

microorganisms capable of degrading hydrocarbons; and

an LC₅₀ value of greater than 3.5 mg/L on *Daphia magna*;

about 5 vol.% to about 95 vol.% of a biodiesel that comprises a distilled biodiesel, a biodiesel with a Modified CSFBT Test Procedure score of less than about 4.0, or both; and

about 0 vol.% to about 90 vol.% of a petroleum diesel;

provided that at least about 8 vol.% biodiesel is included when the blended fuel composition does not include the petroleum diesel.

2. The blended fuel composition of Claim 1, wherein the synthetic paraffinic diesel exhibits a cetane number of at least about 70 as measured by ASTM D613.

3. The blended fuel composition of Claim 1, wherein the synthetic paraffinic diesel exhibits a cetane number of at least about 73 as measured by ASTM D613.

4. The blended fuel composition of Claim 1, wherein the composition comprises

about 6 vol.% to about 50 vol.% of the synthetic paraffinic diesel:

about 6 vol.% to about 50 vol.% of the biodiesel; and

about 0 vol.% to about 88 vol.% of the petroleum diesel.

5. The blended fuel composition of Claim 1, wherein the composition comprises

5 about 10 vol.% to about 30 vol.% of the synthetic paraffinic diesel:

about 10 vol.% to about 30 vol.% of the biodiesel; and

about 4 vol.% to about 80 vol.% of the petroleum diesel.

6. The blended fuel composition of Claim 1, wherein the composition comprises

about 20 vol.% to about 25 vol.% of the synthetic paraffinic diesel:

10 about 20 vol.% to about 25 vol.% of the biodiesel; and

about 50 vol.% to about 60 vol.% of the petroleum diesel.

7. The blended fuel composition of Claim 1, wherein a volume ratio of synthetic paraffinic diesel to biodiesel in the blended fuel composition is about 10:90 to about 90:10.

8. The blended fuel composition of Claim 1, wherein a volume ratio of synthetic paraffinic diesel to biodiesel in the blended fuel composition is about 45:55 to about 55:45.

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9. The blended fuel composition of Claim 1, ~~wherein the synthetic paraffinic diesel~~

~~comprises a hydroprocessed biorenewable feedstock~~wherein the hydroprocessed biorenewable feedstock comprises a hydroprocessed product of corn oil, inedible corn oil, babassu oil, carinata oil, soybean oil, canola oil, coconut oil, rapeseed oil, tall oil, tall oil fatty acid, palm oil, palm oil fatty acid distillate, jatropha oil, palm kernel oil, sunflower oil, castor oil, camelina oil, archaeal oil, bacterial oil, fungal oil, protozoal oil, algal oil, seaweed oil, oils from halophiles, rendered fats, inedible tallow, edible tallow, technical tallow, floatation tallow, lard, poultry fat, poultry oils, fish fat, fish oils, frying oils, yellow grease, brown grease, waste vegetable oils, restaurant greases, trap grease from municipalities such as water treatment facilities, and spent oils from industrial packaged food operations, or a mixture of any two or more thereof.

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~~10. The blended fuel composition of Claim 9, wherein the hydroprocessed biorenewable feedstock comprises a hydrotreated and optionally hydroisomerized biorenewable feedstock.~~

~~11. The blended fuel composition of Claim 9, wherein the hydroprocessed biorenewable feedstock comprises a hydroprocessed product of an animal fat, animal oil, microbial oil, plant fat, plant oil, vegetable fat, vegetable oil, grease, or a mixture of any two or more thereof.~~

~~12. The blended fuel composition of Claim 9, wherein the hydroprocessed biorenewable feedstock comprises a hydroprocessed product of corn oil, inedible corn oil, babassu oil, carinata oil, soybean oil, canola oil, coconut oil, rapeseed oil, tall oil, tall oil fatty acid, palm oil, palm oil fatty acid distillate, jatropha oil, palm kernel oil, sunflower oil, castor oil, camelina oil, archaeal oil, bacterial oil, fungal oil, protozoal oil, algal oil, seaweed oil, oils from halophiles, rendered fats, inedible tallow, edible tallow, technical tallow, floatation tallow, lard, poultry fat, poultry oils, fish fat, fish oils, frying oils, yellow grease, brown grease, waste vegetable oils, restaurant greases, trap grease from municipalities such as water treatment facilities, and spent oils from industrial packaged food operations, or a mixture of any two or more thereof.~~

~~13. The blended fuel composition of Claim 9, wherein the hydroprocessed biorenewable feedstock comprises a hydrotreated and hydroisomerized biorenewable feedstock.~~

~~14. The blended fuel composition of Claim 1, wherein the synthetic paraffinic diesel comprises by weight of the hydroprocessed biorenewable feedstock~~
~~at least about 80 wt% of two or more different carbon number paraffins that~~
~~fall within the C₁₁ to C₁₈ range;~~
~~less than about 0.5 wt% oxygenates;~~
~~about 0.1 wt% to about 18 wt% cycloparaffins; and~~
~~less than about 1 wt % aromatics;~~
~~wherein the hydroprocessed biorenewable feedstock possesses~~
~~a density less than about 0.800 kg/L;~~
~~a biodegradability of at least about 40% after about 23 days of~~
~~exposure to microorganisms capable of degrading~~
~~hydrocarbons; and~~
~~an LC₅₀ value of greater than about 3.5 mg/L on *Daphia magna*.~~

~~1510. The blended fuel composition of Claim 1, wherein the synthetic paraffinic diesel has a sulfur content less than about 5 wppm.~~

- ~~16~~11. The blended fuel composition of Claim 1, wherein the synthetic paraffinic diesel has less than about 0.5 wt % aromatics.
- ~~17~~12. The blended fuel composition of Claim 1, wherein the synthetic paraffinic diesel has less than about 0.01 wt% benzene.
- 5 ~~18~~13. The blended fuel composition of Claim 1, wherein the synthetic paraffinic diesel has a cloud point less than about -10 °C.
- ~~19~~14. The blended fuel composition of Claim 1, wherein paraffins of the synthetic paraffinic diesel comprise iso-paraffins and n-paraffins.
- 10 ~~20~~15. The blended fuel composition of Claim ~~19~~14, wherein a weight ratio of iso-paraffins to n-paraffins is at least about 4:1.
- ~~21~~16. The blended fuel composition of Claim 1, wherein the paraffins of the synthetic paraffinic diesel comprise C₁₆ and C₁₈ paraffins.
- 15 ~~22~~17. The blended fuel composition of Claim 1, wherein the biodiesel comprises a fatty acid C₁-C₄ alkyl ester produced from an animal fat, animal oil, microbial oil, plant fat, plant oil, vegetable fat, vegetable oil, grease, or a mixture of any two or more thereof.
- 20 ~~23~~18. The blended fuel composition of Claim 1, wherein the biodiesel comprises a fatty acid C₁-C₄ alkyl ester produced from corn oil, inedible corn oil, babassu oil, carinata oil, soybean oil, canola oil, coconut oil, rapeseed oil, tall oil, tall oil fatty acid, palm oil, palm oil fatty acid distillate, jatropha oil, palm kernel oil, sunflower oil, castor oil, camelina oil, archaeal oil, bacterial oil, fungal oil, protozoal oil, algal oil, seaweed oil, oils from halophiles, rendered fats, inedible tallow, edible tallow, technical tallow, floatation tallow, lard, poultry fat, poultry oils, fish fat, fish oils, frying oils, yellow grease, brown grease, waste vegetable oils, restaurant greases, trap grease from municipalities such as water treatment facilities, and spent oils from industrial
- 25 packaged food operations, or a mixture of any two or more thereof.
- ~~24~~19. The blended fuel composition of Claim 1, wherein the biodiesel comprises a fatty acid methyl ester, a fatty acid ethyl ester, a fatty acid propyl ester, a fatty acid butyl ester, or a mixture of any two or more thereof.

- ~~2520~~. The blended fuel composition of Claim 1, wherein the biodiesel comprises a cold-filtered biodiesel that is not distilled.
- ~~2621~~. The blended fuel composition of Claim 1, wherein the composition does not comprise a cold-filtered biodiesel.
- 5 ~~2722~~. The blended fuel composition of Claim 1, wherein the biodiesel is distilled biodiesel.
- ~~2823~~. The blended fuel composition of Claim 1, wherein the biodiesel comprises an additive that reduces a Modified CSFBT Test Procedure score.
- ~~2924~~. The blended fuel composition of Claim 1, wherein the biodiesel comprises distilled biodiesel and a cold-filtered biodiesel, and wherein a volume ratio of cold-filtered
10 biodiesel to distilled biodiesel is about 100:1 to about 1:100.
- ~~3025~~. The blended fuel composition of Claim 1, wherein the petroleum diesel is hydrotreated straight-run diesel, hydrotreated fluidized catalytic cracker (FCC) light cycle oil, hydrotreated coker light gasoil, hydrocracked FCC heavy cycle oil, and combinations thereof.
- 15 ~~3126~~. The blended fuel composition of Claim 1, wherein the composition is suitable as a diesel fuel, a diesel fuel additive, a diesel fuel blendstock, or a combination of any two or more thereof.
- ~~3227~~. A method of producing the blended fuel composition of any one of Claims 1-~~3126~~, the method comprising combining
20 about 5 vol.% to about 95 vol.% of synthetic paraffinic diesel, wherein the synthetic paraffinic diesel comprises a hydroprocessed biorenewable feedstock, wherein the hydroprocessed biorenewable feedstock comprises a hydrotreated and hydroisomerized biorenewable feedstock, wherein the hydroprocessed biorenewable feedstock comprises a hydroprocessed product of an animal fat,
25 animal oil, microbial oil, plant fat, plant oil, vegetable fat, vegetable oil, grease, or a mixture of any two or more thereof, and wherein the synthetic paraffinic diesel comprises by weight of the hydroprocessed biorenewable feedstock

at least 80 wt% of two or more different carbon number paraffins that
fall within the C₁₁ to C₁₈ range;
less than 0.5 wt% oxygenates;
0.1 wt% to 18 wt% cycloparaffins; and
less than 1 wt % aromatics;
wherein the hydroprocessed biorenewable feedstock possesses
a density less than 0.800 kg/L;
a biodegradability of at least 40% after 23 days of exposure to
microorganisms capable of degrading hydrocarbons; and
an LC₅₀ value of greater than 3.5 mg/L on *Daphia magna*;
 about 5 vol.% to about 95 vol.% of a biodiesel that comprises a distilled
 biodiesel, a biodiesel with a Modified CSFBT Test Procedure score of
 less than about 4.0, or both; and
 about 0 vol.% to about 90 vol.% of a petroleum diesel, provided that at least
 about 8 vol.% biodiesel is included when the blended fuel composition
 does not include the petroleum diesel;
 to produce the blended fuel composition.

~~3328.~~ The method of Claim ~~3227~~, wherein the synthetic paraffinic diesel and the biodiesel
 are combined to form an initial blend, and the initial blend is subsequently combined
 with the petroleum diesel.

~~34. A kit comprising a synthetic paraffinic diesel and instructions for generating a blended
 fuel composition of any one of Claims 1-31.~~

~~35. The kit of Claim 34, wherein the kit further comprises a biodiesel.~~

~~36. The kit of Claim 35, wherein the kit comprises a blend of the synthetic paraffinic diesel
 and the biodiesel.~~

~~37. The kit of Claim 36, wherein the kit comprises a blend of about 5 vol.% to about 95
 vol.% of the synthetic paraffinic diesel and about 5 vol.% to about 90 vol.% of the
 biodiesel.~~

~~38. A kit comprising a biodiesel and instructions for generating a blended fuel composition
 of any one of Claims 1-31.~~

3929. A blended fuel composition comprising

About 5 vol.% to about 95 vol.% of a synthetic paraffinic diesel exhibiting a cetane number of at least about 70 as measured by ASTM D613, wherein the synthetic paraffinic diesel comprises a hydroprocessed biorenewable feedstock, wherein the hydroprocessed biorenewable feedstock comprises a hydrotreated and hydroisomerized biorenewable feedstock, wherein the hydroprocessed biorenewable feedstock comprises a hydroprocessed product of an animal fat, animal oil, microbial oil, plant fat, plant oil, vegetable fat, vegetable oil, grease, or a mixture of any two or more thereof, and wherein the synthetic paraffinic diesel comprises by weight of the hydroprocessed biorenewable feedstock

at least 80 wt% of two or more different carbon number paraffins that fall within the C₁₁ to C₁₈ range;

less than 0.5 wt% oxygenates;

0.1 wt% to 18 wt% cycloparaffins; and

less than 1 wt % aromatics;

wherein the hydroprocessed biorenewable feedstock possesses

a density less than 0.800 kg/L;

a biodegradability of at least 40% after 23 days of exposure to

microorganisms capable of degrading hydrocarbons; and

an LC₅₀ value of greater than 3.5 mg/L on *Daphia magna*;

about 5 vol.% to about 95 vol.% of a biodiesel; and

about 0 vol.% to about 90 vol.% of a petroleum diesel;

provided that when the blended fuel composition does not include petroleum diesel, at

least about 8 vol.% biodiesel is included.

4030. The blended fuel composition of Claim **3929**, wherein the synthetic paraffinic diesel exhibits a cetane number of at least about 73 as measured by ASTM D613.

4131. The blended fuel composition of Claim **3929**, wherein the biodiesel comprises a distilled biodiesel, a biodiesel with a Modified CSFBT Test Procedure score of less than about 4.0, or both.

4232. The blended fuel composition of Claim **3929**, wherein the composition comprises about 6 vol.% to about 50 vol.% of the synthetic paraffinic diesel;

about 6 vol.% to about 50 vol.% of the biodiesel; and
 about 0 vol.% to about 88 vol.% of the petroleum diesel.

~~4333~~. The blended fuel composition of Claim ~~3929~~, wherein the composition comprises
 about 10 vol.% to about 30 vol.% of the synthetic paraffinic diesel;
 5 about 10 vol.% to about 30 vol.% of the biodiesel; and
 about 4 vol.% to about 80 vol.% of the petroleum diesel.

~~4434~~. The blended fuel composition of Claim ~~3929~~, wherein the composition comprises
 about 20 vol.% to about 25 vol.% of the synthetic paraffinic diesel;
 about 20 vol.% to about 25 vol.% of the biodiesel; and
 10 about 50 vol.% to about 60 vol.% of the petroleum diesel.

~~4535~~. The blended fuel composition of Claim ~~3929~~, wherein a volume ratio of synthetic
 paraffinic diesel to biodiesel in the blended fuel composition is about 10:90 to about
 90:10.

~~4636~~. The blended fuel composition of Claim ~~3929~~, wherein a volume ratio of synthetic
 15 paraffinic diesel to biodiesel in the blended fuel composition is about 45:55 to about
 55:45.

~~47. The blended fuel composition of Claim 39, wherein the synthetic paraffinic diesel
 comprises a hydroprocessed biorenewable feedstock.~~

~~48. The blended fuel composition of Claim 47, wherein the hydroprocessed biorenewable
 20 feedstock comprises a hydrotreated and optionally hydroisomerized biorenewable
 feedstock.~~

~~49. The blended fuel composition of Claim 47, wherein the hydroprocessed biorenewable
 feedstock comprises a hydroprocessed product of an animal fat, animal oil, microbial
 oil, plant fat, plant oil, vegetable fat, vegetable oil, grease, or a mixture of any two or
 25 more thereof.~~

~~5037~~. The blended fuel composition of Claim ~~4729~~, wherein the hydroprocessed
 biorenewable feedstock comprises a hydroprocessed product of corn oil, inedible corn
 oil, babassu oil, carinata oil, soybean oil, canola oil, coconut oil, rapeseed oil, tall oil,
 tall oil fatty acid, palm oil, palm oil fatty acid distillate, jatropha oil, palm kernel oil,

sunflower oil, castor oil, camelina oil, archaeal oil, bacterial oil, fungal oil, protozoal oil, algal oil, seaweed oil, oils from halophiles, rendered fats, inedible tallow, edible tallow, technical tallow, floatation tallow, lard, poultry fat, poultry oils, fish fat, fish oils, frying oils, yellow grease, brown grease, waste vegetable oils, restaurant greases, trap grease from municipalities such as water treatment facilities, and spent oils from industrial packaged food operations, or a mixture of any two or more thereof.

~~51. The blended fuel composition of Claim 47, wherein the hydroprocessed biorenewable feedstock comprises a hydrotreated and hydroisomerized biorenewable feedstock.~~

~~52. The blended fuel composition of Claim 47, wherein the synthetic paraffinic diesel comprises by weight of the hydroprocessed biorenewable feedstock~~
~~at least about 80 wt% of two or more different carbon number paraffins that~~
~~fall within the C₁₄-to C₁₈ range;~~
~~less than about 0.5 wt% oxygenates;~~
~~about 0.1 wt% to about 18 wt% cycloparaffins; and~~
~~less than about 1 wt % aromatics;~~
~~wherein the hydroprocessed biorenewable feedstock possesses~~
~~a density less than about 0.800 kg/L;~~
~~a biodegradability of at least about 40% after about 23 days of~~
~~exposure to microorganisms capable of degrading~~
~~hydrocarbons; and~~
~~an LC₅₀ value of greater than about 3.5 mg/L on *Daphia magna*.~~

5338. The blended fuel composition of Claim 3929, wherein the synthetic paraffinic diesel has a sulfur content less than about 5 wppm.

5439. The blended fuel composition of Claim 3929, wherein the synthetic paraffinic diesel has less than about 0.5 wt % aromatics.

5540. The blended fuel composition of Claim 3929, wherein the synthetic paraffinic diesel has less than about 0.01 wt% benzene.

5641. The blended fuel composition of Claim 3929, wherein the synthetic paraffinic diesel has a cloud point less than about -10 °C.

5742. The blended fuel composition of Claim 3929, wherein paraffins of the synthetic paraffinic diesel comprise iso-paraffins and n-paraffins.
5843. The blended fuel composition of Claim 5742, wherein a weight ratio of iso-paraffins to n-paraffins is at least about 4:1.
- 5 5944. The blended fuel composition of Claim 3929, wherein the paraffins of the synthetic paraffinic diesel comprise C₁₆ and C₁₈ paraffins.
6045. The blended fuel composition of Claim 3929, wherein the biodiesel comprises a fatty acid C₁-C₄ alkyl ester produced from an animal fat, animal oil, microbial oil, plant fat, plant oil, vegetable fat, vegetable oil, grease, or a mixture of any two or more thereof.
- 10 6146. The blended fuel composition of Claim 3929, wherein the biodiesel comprises a fatty acid C₁-C₄ alkyl ester produced from corn oil, inedible corn oil, babassu oil, carinata oil, soybean oil, canola oil, coconut oil, rapeseed oil, tall oil, tall oil fatty acid, palm oil, palm oil fatty acid distillate, jatropha oil, palm kernel oil, sunflower oil, castor oil, camelina oil, archaeal oil, bacterial oil, fungal oil, protozoal oil, algal oil, seaweed oil,
- 15 oils from halophiles, rendered fats, inedible tallow, edible tallow, technical tallow, floatation tallow, lard, poultry fat, poultry oils, fish fat, fish oils, frying oils, yellow grease, brown grease, waste vegetable oils, restaurant greases, trap grease from municipalities such as water treatment facilities, and spent oils from industrial packaged food operations, or a mixture of any two or more thereof.
- 20 6247. The blended fuel composition of Claim 3929, wherein the biodiesel comprises a fatty acid methyl ester, a fatty acid ethyl ester, a fatty acid propyl ester, a fatty acid butyl ester, or a mixture of any two or more thereof.
6348. The blended fuel composition of Claim 3929, wherein the biodiesel comprises a cold-filtered biodiesel that is not distilled.
- 25 6449. The blended fuel composition of Claim 3929, wherein the composition does not comprise a cold-filtered biodiesel.
6550. The blended fuel composition of Claim 3929, wherein the biodiesel is distilled biodiesel.

6651. The blended fuel composition of Claim 3929, wherein the biodiesel comprises an additive that reduces a Modified CSFBT Test Procedure score.

6752. The blended fuel composition of Claim 3929, wherein a volume ratio of cold-filtered biodiesel to distilled biodiesel is about 100:1 to about 1:100.

5 6853. The blended fuel composition of Claim 3929, wherein the petroleum diesel is hydrotreated straight-run diesel, hydrotreated fluidized catalytic cracker (FCC) light cycle oil, hydrotreated coker light gasoil, hydrocracked FCC heavy cycle oil, and combinations thereof.

10 6954. The blended fuel composition of Claim 3929, wherein the composition is suitable as a diesel fuel, a diesel fuel additive, a diesel fuel blendstock, or a combination of any two or more thereof.

70. A method of producing the blended fuel composition of any one of Claims 39-6929-54, the method comprising combining

about 5 vol.% to about 95 vol.% of synthetic paraffinic diesel exhibiting a cetane

15 number of at least about 70 as measured by ASTM D613, wherein the synthetic paraffinic diesel comprises a hydroprocessed biorenewable feedstock, wherein the hydroprocessed biorenewable feedstock comprises a hydrotreated and hydroisomerized biorenewable feedstock, wherein the hydroprocessed biorenewable feedstock comprises a hydroprocessed product
 20 of an animal fat, animal oil, microbial oil, plant fat, plant oil, vegetable fat, vegetable oil, grease, or a mixture of any two or more thereof, and wherein the synthetic paraffinic diesel comprises by weight of the hydroprocessed biorenewable feedstock

25 at least 80 wt% of two or more different carbon number paraffins that fall within the C₁₁ to C₁₈ range;

less than 0.5 wt% oxygenates;

0.1 wt% to 18 wt% cycloparaffins; and

less than 1 wt % aromatics;

wherein the hydroprocessed biorenewable feedstock possesses

30 a density less than 0.800 kg/L;

a biodegradability of at least 40% after 23 days of exposure to microorganisms capable of degrading hydrocarbons; and an LC₅₀ value of greater than 3.5 mg/L on *Daphia magna*;

about 5 vol.% to about 95 vol.% of a biodiesel; and

- 5 about 0 vol.% to about 90 vol.% of a petroleum diesel, provided that at least about 8 vol.% biodiesel is included when the blended fuel composition does not include the petroleum diesel;
- to produce the blended fuel composition.

- 10 ~~7156.~~ The method of Claim ~~7055~~, wherein the synthetic paraffinic diesel and the biodiesel are combined to form an initial blend, and the initial blend is subsequently combined with the petroleum diesel.

~~72. A kit comprising a synthetic paraffinic diesel and instructions for generating a blended fuel composition of any one of Claims 39-69.~~

~~73. The kit of Claim 72, wherein the kit further comprises a biodiesel.~~

- 15 ~~74. The kit of Claim 73, wherein the kit comprises a blend of the synthetic paraffinic diesel and the biodiesel.~~

~~75. The kit of Claim 74, wherein the kit comprises a blend of about 5 vol.% to about 95 vol.% of the synthetic paraffinic diesel and about 5 vol.% to about 95 vol.% of the biodiesel.~~

- 20 ~~76. A kit comprising a biodiesel and instructions for generating a blended fuel composition of any one of Claims 39-69.~~