In an aspect, there is provided a method for powering a diesel engine with a fuel emulsion comprising the step of preparing the fuel emulsion by emulsifying a fuel and water in the presence of an emulsifier package which comprises a short-chained surfactant of the formula (I)

$$R^a\text{-}O\text{-}(AO^a)_m\text{-}R^{a'} \qquad (I)$$

in which

R^a is a branched $C_{8\text{-}14}$ alkyl ,

AO^a is an ethylene oxide radical, propylene oxide radical, butylene oxide radical, pentylene oxide radical or mixtures thereof,

m is a number from 1 to 100, and

$R^{a'}$ is hydrogen or $C_{1\text{-}4}$ alkyl; and

additionally comprises a long-chained surfactant of the formula (II)

$$R^b\text{-}O\text{-}(AO^b)_n\text{-}R^{b'} \qquad (II)$$

in which

R^b is a linear or branched $C_{16\text{-}32}$ alkyl,

AO^b is an ethylene oxide radical, propylene oxide radical, butylene oxide radical, pentylene oxide radical or mixtures thereof,

n is a number from 1 to 100 and

$R^{b'}$ is hydrogen or $C_{1\text{-}4}$ alkyl.

In an example, the object was also achieved by the fuel emulsion for powering a diesel engine as defined above.

In another aspect, there is provided a fuel emulsion for powering a diesel engine, wherein the fuel emulsion comprises at least 10 wt% water and furthermore

a short-chained surfactant of the formula (I)

$$R^a\text{-}O\text{-}(AO^a)_m\text{-}R^{a'} \qquad (I)$$

in which

R^a is a branched $C_{8\text{-}14}$ alkyl ,

AO^a is an ethylene oxide radical, propylene oxide radical, butylene oxide radical, pentylene oxide radical or mixtures thereof,

m is a number from 1 to 100, and

$R^{a'}$ is hydrogen or C_{1-4} alkyl; and

additionally comprises a long-chained surfactant of the formula (II)

$$R^b\text{-}O\text{-}(AO^b)_n\text{-}R^{b'} \qquad (II)$$

in which

R^b is a linear or branched C_{16-32} alkyl,

AO^b is an ethylene oxide radical, propylene oxide radical, butylene oxide radical, pentylene oxide radical or mixtures thereof,

n is a number from 1 to 100 and

$R^{b'}$ is hydrogen or C_{1-4} alkyl,

Wherein the weight ratio of the water to the fuel is in the range of 1:0.1 to 1:10.

Claims

1. A method for powering a diesel engine with a fuel emulsion comprising the step of preparing the fuel emulsion by emulsifying a fuel and water in the presence of an emulsifier package which comprises a short-chained surfactant of the formula (I)

$$R^a\text{-}O\text{-}(AO^a)_m\text{-}R^{a'} \qquad (I)$$

in which

R^a is a branched $C_{8\text{-}14}$ alkyl ,

AO^a is an ethylene oxide radical, propylene oxide radical, butylene oxide radical, pentylene oxide radical or mixtures thereof,

m is a number from 1 to 100, and

$R^{a'}$ is hydrogen or $C_{1\text{-}4}$ alkyl; and

additionally comprises a long-chained surfactant of the formula (II)

$$R^b\text{-}O\text{-}(AO^b)_n\text{-}R^{b'} \qquad (II)$$

in which

R^b is a linear or branched $C_{16\text{-}32}$ alkyl,

AO^b is an ethylene oxide radical, propylene oxide radical, butylene oxide radical, pentylene oxide radical or mixtures thereof,

n is a number from 1 to 100 and

$R^{b'}$ is hydrogen or $C_{1\text{-}4}$ alkyl.

2. The method according to claim 1 wherein m is a number from 3 to 60.

3. The method according to claims 1 or 2 wherein n is a number from 3 to 60.

4. The method according to any of claims 1 to 3 where R^a is isotridecyl.

5. The method according to any of claims 1 to 4 where AO^a is an ethylene oxide radical.

6. The method according to any of claims 1 to 5 where R^b is a linear $C_{16\text{-}22}$ alkyl.

7. The method according to any of claims 1 to 6 where AO^b is a mixture of an ethylene oxide radical and a propylene oxide radical.

8. The method according to any of claims 1 to 7 where $R^{a'}$ and $R^{b'}$ are hydrogen.

9. The method according to any of claims 1 to 8 where the emulsifier package comprises the short-chained surfactant and the long-chained surfactant in a weight ratio of 10:1 to 1:10, preferably 4:1 to 1:4.

10. The method according to any of claims 1 to 9 where the emulsifier package comprises 1 to 99 wt%, 5 to 90 wt%, 10 to 80 wt%, or 20 to 70 wt% of the long-chained surfactant.

11. The method according to any of claims 1 to 10 where the emulsifier package comprises 1 to 99 wt%, 5 to 90 wt%, 10 to 80 wt%, or 20 to 70 wt% of the short-chained surfactant.

12. The method according to any of claims 1 to 11 where the emulsifier package comprises at least 10, 30, or 50 wt% water, an organic solvent, or a mixture of water and an organic solvent.

13. The method according to any of claims 1 to 12 where the fuel emulsion comprises the emulsifier package in an amount of 0.05 to 0.4 wt% based on the diesel.

14. The method according to any of claims 12 to 13 where the fuel emulsion comprises 40 to 80 wt% water.

15. The method according to any of claims 1 to 14 where the fuel is marine fuel.

16. A fuel emulsion for powering a diesel engine, wherein the fuel emulsion comprises at least 10 wt% water and furthermore
a short-chained surfactant of the formula (I)

$$R^a\text{-}O\text{-}(AO^a)_m\text{-}R^{a'} \qquad (I)$$

in which

R^a is a branched $C_{8\text{-}14}$ alkyl ,

AO^a is an ethylene oxide radical, propylene oxide radical, butylene oxide radical, pentylene oxide radical or mixtures thereof,

m is a number from 1 to 100, and

$R^{a'}$ is hydrogen or C_{1-4} alkyl; and

additionally comprises a long-chained surfactant of the formula (II)

$$R^b\text{-}O\text{-}(AO^b)_n\text{-}R^{b'} \qquad (II)$$

in which

R^b is a linear or branched C_{16-32} alkyl,

AO^b is an ethylene oxide radical, propylene oxide radical, butylene oxide radical, pentylene oxide radical or mixtures thereof,

n is a number from 1 to 100 and

$R^{b'}$ is hydrogen or C_{1-4} alkyl,

Wherein the weight ratio of the water to the fuel is in the range of 1:0.1 to 1:10.

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