CLAIMS

1. A method of purifying a recycled or renewable organic material, wherein the recycled or renewable organic material comprises one or more impurities selected from a group consisting of silicon compounds, phosphorous compounds, chlorine compounds, nitrogen compounds, sulfur compounds, and hydroxyaromatic compounds, comprising the steps of

(a) providing the recycled or renewable organic material;

(b) optionally pre heat treating the recycled or renewable organic material at 180 to 325°C, and optionally adding acid before or after the pre heat treatment process, and optionally filtering the pre heat treated recycled or renewable organic material after the pre heat treatment;

(c) heat treating the recycled or renewable organic material at 100 to 450°C at a pressure from 500 to 5000 kPa, optionally in the presence of an adsorbent, optionally adding water before or during the heat treatment process, and optionally adding acid before or after the heat treatment process, and optionally filtering the heat treated recycled or renewable organic material after the heat treatment;

(d) evaporating volatile silicon compounds from the heat treated recycled or renewable organic material compounds thereby reducing the silicon content of the heat treated recycled or renewable organic material;

(e) optionally thermally cracking the recycled or renewable organic material thereby reducing the oxygen and phosphorous content of the heat treated recycled or renewable organic material, and optionally removing volatiles from the thermally cracked recycled or renewable organic material, and optionally removing solids/precipitates from the recycled or renewable organic material; and

(f) hydrotreating the heat treated recycled or renewable organic material in a presence of a hydrotreating catalyst;

to obtain purified hydrotreated recycled or renewable organic material, which comprises (i) less than 20%, or less than 10%, or less than 5%, of the original silicon content of the recycled or renewable organic material provided in step (a) and/or (ii) less than 30% of the original phosphorous content of the recycled or renewable organic material provided in step (a) and/or (iii) less than 50% of the chlorine content of the recycled or renewable organic material provided in step (a)renewable organic material.

2. A method as claimed in claim 1, wherein step (c) is accomplished by (c1) heating the recycled or renewable organic material in the presence of an aqueous solution of alkaline metal hydroxide at a temperature from 100 to 450°C, or from 150 to 400°C or from 200 to 300°C, to obtain the purified recycled or renewable organic material comprising less than 50% of the chlorine content of the recycled or renewable organic material provided in step (a).

3. A method as claimed in claim 1 or 2, wherein the residence time is from 1 to 180 min, or from 2 to 90 min, or from 5 to 60 min in step (c1).

4. A method as claimed in any one of claims 1 to 3, wherein the alkaline metal hydroxide is selected from a group consisting of KOH, LiOH, NaOH and mixtures thereof.

5. A method as claimed in any one of claims 1 to 3 wherein the alkaline metal hydroxide is NaOH.

6. A method as claimed in any one of claims 1 to 5, wherein the concentration of the aqueous alkaline metal hydroxide is from 0.1 to 10.0 mol/L and the ratio of the aqueous solution of alkaline metal hydroxide to the treated recycled or renewable organic is more than 0.1 g/g, or from 0.5 to 1.5 g/g.

7. A method as claimed in claim 1, wherein step (c) is accomplished by (c2) heat treating the recycled or renewable organic material at a temperature between 250 to 450°C, or at 350 to 450°C, to obtain heat treated the recycled or renewable organic material.

8. A method as claimed in claim 1, wherein step (c) is accomplished by (c3) heat treating the recycled or renewable organic material at 180 to 325°C, or at 200 to 300°C or at a 240 to 280°C, to form a heat treated recycled or renewable organic material, wherein the at least part of silicon compounds present in the recycled or renewable organic material are converted to volatile silicon compounds

9. A method as claimed in claim 8, wherein the residence time, is from 1 to 300 min, or from 5 to 90 min, or from 20 to 40 min in heat treatment of step (c3).

10. A method as claimed in any one of claims 8 or 9, wherein the method comprises (d) evaporating volatile silicon compounds from the heat treated recycled or renewable organic material

to obtain

(i) a vapor fraction comprising the major part of volatile silicon compounds, and (ii) a heat treated recycled or renewable organic material fraction comprising less silicon than the recycled or renewable organic material provided in step (a).

11. A method as claimed in any one of claims 8 to 10, wherein evaporation in step (d) is performed at 150°C to 225°C, or at 160°C to 200°C, or at 160 to 180°C.

12. A method as claimed in any one of claims 8 to 11, wherein the pressure in evaporation of step (d) is from 0.1 to 5 kPa, or from 0.1 to 3 kPa.

13. A method as claimed in any one of claims 8 to 12, wherein in evaporation of step (d) 1 to 10 wt%, or from 1 to 8 wt-%, or from 1 to 5 wt-%, or from 1 to 3 wt-%, of the heat treated recycled or renewable organic material is evaporated.

14. A method as claimed in any one of claims 8 to 13, wherein water is added to the heat treated recycled or renewable organic material so that water content before evaporation step (d) is from 1 to 5 wt%, or from 1.5 to 4 wt% or from 2 to 3 wt% of the total weight of the heat treated recycled or renewable organic material.

15. A method as claimed in any one of claims 1 to 14, wherein the temperature in step (c) is from 180 to 325°C., or from 200 to 300°C, or from 240 to 280°C.

16. A method as claimed in any one of claims 1 to 15, wherein the residence time is from 1 to 300 min, or from 5 to 240 min, or from 30 to 90 min in step (c).

17. A method as claimed in any one of claims 1 to 16, wherein the adsorbent in step (c) is selected from silica-based adsorbents.

18. A method as claimed in claim 17 wherein the silica-based adsorbents are selected from a group consisting of alumina silicate, silica gel and mixtures thereof

19. A method as claimed in any one of claims 1 to 18, wherein the amount of adsorbent in step (c) is from 0.1 to 10.0 wt-%, or 0.5 to 2.0 wt-%, of the total weight of the treated recycled or renewable organic material.

20. A method as claimed in any one of claims 10 to 19, wherein after step (d) silicon content of the heat treated recycled or renewable organic material fraction is less than 50%, or less than 30 %, of the original silicon content of the recycled or renewable organic material provided in step (a).

21. A method as claimed in any of claims 1 to 20, wherein step (f) is accomplished by (f1) hydrodeoxygenating (HDO) the heat treated recycled or renewable organic material fraction in a presence of a HDO catalyst at a temperature from 290 to 350°C under pressure from 4 to 20 MPa and under continuous hydrogen flow to obtain purified recycled or renewable organic material comprising less than 1 wt% of oxygen and/or less than 20%, or less than 10%, or less than 5%, of the original silicon content of the recycled or renewable organic material provided in step (a) and/or less than 30% of the original phosphorous
content of the recycled or renewable organic material provided in step (a) and/or less than 50% of the chlorine content of the recycled or renewable organic material provided in step (a).

22. A method as claimed in any one of claim 1 to 21, wherein the recycled or renewable organic material is selected from a group consisting of plant based fats and oils, animal based fats and oils, fossil waste-based oils, waste oils, algal oils and microbial oils.

23. A process for producing recycled or renewable hydrocarbons, comprising steps of

(x) purifying the recycled or renewable organic material as claimed in any one of claims 1 to 22, and

(y) subjecting the purified recycled or renewable organic material to a oil refinery conversion process, wherein the oil refinery conversion process comprises altering the molecular weight of the feed, removal of heteroatoms from the feed, altering the degree of saturation of the feed, rearranging the molecular structure of the feed, or any combination thereof to obtain at least one recycled or renewable hydrocarbon.

24. A recycled or renewable organic material when purified by the method according to any one of claims 1 to 22, or recycled or renewable hydrocarbons when produced by the process according to claim 23.