

CLAIMS

1. A method for producing renewable hydrocarbons from an oxygen containing renewable feedstock, the feedstock comprising dissolved impurities selected from impurities comprising phosphorus and impurities comprising at least one metal, the feedstock further comprising at least one of triglycerides and free fatty acids, the method comprising
- a) obtaining a net elementary charge Q1 based on phosphorus and the at least one metal in a first feedstock;
 - b) mixing the first feedstock with an elementary charge balancing component to obtain the feedstock to be purified, which feedstock to be purified has a net elementary charge Qt based on phosphorus and the at least one metal within a range of from -5 to 15 mmol elementary charge/kg of the feedstock to be purified;
 - c) subjecting the feedstock to be purified to heat treatment at a temperature of 180-400 °C, in order to precipitate compounds containing said phosphorus and said at least one metal;
 - d) removing the formed precipitate compounds comprising said at least one metal and said phosphorus, to obtain a purified feedstock; and
 - e) subjecting the purified feedstock to hydrotreatment using a catalyst sensitive to at least one of said impurities;

wherein the net elementary charge Q based on phosphorus and the at least one metal is obtained by equation (I)

$$Q = (C_P \times Q_P) + \sum_i (C_{M_i} \times Q_{M_i}) \quad (I)$$

wherein

C_P is the concentration of dissolved phosphorus in the feedstock in mmol/kg of feedstock,

Q_P is the elementary charge of dissolved phosphorus in the feedstock,

C_{M_i} is the concentration of dissolved metal i in the feedstock in mmol/kg of feedstock,

- Q_{M_i} is the elementary charge of the dissolved metal I; and

dissolved metals present in an amount of at least 1 ppm by weight are taken into account in formula (I).

2. The method according to claim 1, wherein the elementary charge balancing component is a second feedstock having a net elementary charge Q2 based on phosphorus and the at least one metal that is electrically opposite to the net elementary charge Q1 based on phosphorus and the at least one metal in the first feedstock.

3. The method of claim 1 or 2, wherein the dissolved metal is selected from sodium, potassium, magnesium, calcium, iron, and mixtures thereof.
4. The method according to any one of the preceding claims, wherein the elementary charge balancing component is selected from metal containing compounds capable of providing metal cations and phosphorus containing compounds capable of providing phosphorus anions.
5. The method according to claim 4, wherein the elementary charge balancing component is selected from sodium hydroxide, sodium soap, potassium hydroxide, potassium soap, calcium hydroxide, calcium soap, magnesium hydroxide, magnesium soap, iron hydroxide, iron soap, and mixtures thereof, and from phosphoric acid, a phospholipid, and mixtures thereof.
6. The method according to any one of the preceding claims, wherein the purification heat treatment is carried out at temperature of 180-310 °C.
7. The method according to claim 6, wherein the purification heat treatment is carried out at temperature of 200-290 °C.
8. The method according to any one of the preceding claims, wherein the purification heat treatment is carried out in the presence of water, in an amount of at most 1 wt-%.
9. The method according to any one of the preceding claims, wherein the purification heat treatment is carried out for a period of time of 1 minute to 3 hours, preferably 15 minutes to 3 hours.
10. The method according to any one of the preceding claims, wherein the removal of the formed precipitate compounds in step d) is carried out by at least one method selected from filtration, settling, centrifugation, water washing, degumming and bleaching.
11. The method according to any one of the preceding claims, wherein said hydrotreatment comprises hydrodeoxygenation and isomerisation, wherein a temperature in the range from 250 to 400 °C, a pressure in the range from 1 to 20 MPa and a hydrogen flow in the range from 350 to 1500 Nl H₂/l feed are used.
12. The method according to any one of the preceding claims, wherein the catalyst comprises at least one of nickel, molybdenum, cobalt, tungsten, and combinations thereof.

13. The method according to claim 12, wherein the catalyst comprises NiMo, CoMo, NiW or CoNiMo.
14. The method according to claim 12 or 13, wherein the catalyst comprises a support comprising at least one of alumina, silica, zeolite, and a combination thereof.
- 5 15. The method according to any one of claims 1-11, wherein the catalyst comprises at least one of platinum, palladium, nickel and combinations thereof, a zeolite selected from ZSM-12, ZSM-23, SAPO-11, SAPO-41 and fernerite, on a support of alumina and/or silica.
16. The method according to any one of the preceding claims, wherein the first feedstock comprises at least one of animal fat, animal oil, plant fat, plant oil, fish fat, fish oil, microbial
10 oil, waste fat, waste oil, residue fat, residue oil, a sludge originating from plant oil production.
17. The method according to any one of the claims 2-16, wherein the optional second feedstock comprises at least one of animal fat, animal oil, plant fat, plant oil, fish fat, fish oil, microbial oil, waste fat, waste oil, residue fat, residue oil, a sludge originating from plant
15 oil production.
18. The method according to claim 16 or 17, wherein the first feedstock and the optional second feedstock comprises at least one of acidulated soapstock, poultry fat, dry rendered poultry fat, brown grease, used cooking oil, tall oil, fraction of tall oil, crude tall oil, tall oil pitch, palm oil effluent sludge, crude palm oil, palm oil, palm seed oil, palm fatty acid
20 distillate, babassu oil, carinata oil, coconut butter, muscat butter oil, sesame oil, maize oil, poppy seed oil, cottonseed oil, soy oil, laurel seed oil, jatropha oil, palm kernel oil, camelina oil, archaeal oil, bacterial oil, fungal oil, protozoal oil, algal oil, seaweed oil, mustard seed oil, oils from halophiles, soybean oil, technical corn oil, rapeseed oil, colza oil, canola oil, sunflower oil, hemp seed oil, olive oil, linseed oil, mustard oil, peanut oil, castor oil, coconut
25 oil, lard, tallow, train oil, spent bleaching earth oil, lignocellulosic based feeds, or mixtures thereof.
19. The method according to any one of the preceding claims, wherein the renewable hydrocarbons are renewable fuels and fuel components.
20. The method according to claim 19, wherein the renewable fuel is gasoline, diesel or
30 aviation fuel.