

CLAIMS

1. Method of hydrotreatment in co-processing of petroleum feeds, in a mixture with at least one feed obtained from renewable sources, for producing fuel bases having a sulphur content below 10 ppm, said method comprising the following stages:
 - a) a first hydrotreatment stage in which said feed passes through at least one first fixed-bed catalytic zone comprising at least one bulk or supported catalyst comprising an active phase constituted by at least one group 6 element and at least one group 8 to 10 element, said elements being in the form of sulphide and the atomic ratio of the group 8 to 10 metal or metals to group 6 metal or metals being strictly greater than 0 and less than 0.095,
 - b) a second hydrotreatment stage into which the effluent from the first hydrotreatment stage is sent directly, and in which said effluent passes through at least one second fixed-bed catalytic zone comprising at least one hydrotreatment catalyst.
2. Method according to claim 1 in which the temperature of the stream entering the first catalytic zone of the first hydrotreatment stage a), said stream being constituted by the mixture of the feed obtained from a renewable source and of the petroleum feed, is comprised between 180 and 220°C.
3. Method according to one of claims 1 or 2 in which the active phase of said catalyst is constituted by at least one group 6 element, said group 6 element being molybdenum and at least one group 8 to 10 element, said group 8 to 10 element being nickel.
4. Method according to one of claims 1 to 3 in which the atomic ratio of the group 8 to 10 metal or metals to group 6 metal or metals is comprised between 0.01 and 0.03.
5. Method according to one of claims 1 to 4 in which in the case when the catalyst is in the supported form, the oxide content of group 6 element is comprised between 1 and 30 wt.% relative to the total weight of the catalyst and the oxide content of group 8 to 10 element is strictly greater than 0% and less than 1.5 wt% of oxide relative to the total weight of the catalyst.
6. Method according to one of claims 1 to 5 in which the first hydrotreatment stage a) is a stage of hydrogenation of the unsaturations of the fatty acid chains of the triglycerides and hydrodeoxygenation of the feed.
7. Method according to one of claims 1 to 6 in which the first hydrotreatment stage a) operates at a temperature comprised between 120 to 450°C, at a total pressure comprised between 1 and 10 MPa, at an hourly space velocity comprised between 0.1 and 10 h⁻¹ and at a hydrogen/feed ratio

expressed as volume of hydrogen, measured under normal conditions of temperature and pressure, per volume of liquid feed generally comprised between 50 NI/l and 3000 NI/l.

8. Method according to one of claims 1 to 7 in which the selectivity for hydrodeoxygenation (HDO) of the first hydrotreatment stage a) is greater than 95%.
9. Method according to one of claims 1 to 8 in which the effluent from the first hydrotreatment stage a) is sent directly, without an intermediate stripping stage, to the second hydrotreatment stage b).
10. Method according to one of claims 1 to 9 in which the temperature of the effluent leaving the first hydrotreatment stage a) is above 300°C.
11. Method according to one of claims 1 to 9 in which the hydrotreatment catalyst used in the second hydrotreatment stage b) comprises nickel as group 8 to 10 element and molybdenum as group 6 element and said catalyst comprises a content of nickel oxide comprised between 0.5 to 10 wt% and a content of molybdenum trioxide comprised between 1 and 30 wt.% on an alumina amorphous mineral support, the percentages being expressed in wt.% relative to the total weight of the catalyst.
12. Method according to one of claims 1 to 11 in which the hydrotreated effluent is subjected to a stage of separation of water and of at least one liquid hydrocarbon base.
13. Method according to one of claims 1 to 12 in which all the hydrotreated liquid effluent is then subjected to a hydroisomerization stage in the presence of a selective hydroisomerization catalyst.
14. Method according to one of claims 1 to 13 in which the petroleum feeds are selected from the group comprising atmospheric gas oils from direct distillation, gas oils obtained from conversion processes, and the feeds obtained from renewable sources are selected from oils and fats of vegetable or animal origin, or mixtures of said feeds, containing triglycerides and/or free fatty acids and/or esters.
15. Method according to one of claims 1 to 14 in which the mixture of conventional petroleum feed and feed from a renewable source is constituted by 60 to 99 wt.% of conventional petroleum feed and 1 to 40 wt.% of feed from a renewable source.

CLAIMS

1. Method of hydrotreatment in co-processing of petroleum feeds, in a mixture with at least one feed obtained from renewable sources, for producing fuel bases having a sulphur content below 10 ppm, said method comprising the following stages:
 - 5 a) a first hydrotreatment stage in which said feed passes through at least one first fixed-bed catalytic zone comprising at least one bulk or supported catalyst comprising an active phase constituted by at least one group 6 element and at least one group 8 to 10 element, said elements being in the form of sulphide and the atomic ratio of the group 8 to 10 metal or metals to group 6 metal or metals is comprised between 0.01
10 and 0.03,
 - b) a second hydrotreatment stage into which the effluent from the first hydrotreatment stage is sent directly, and in which said effluent passes through at least one second fixed-bed catalytic zone comprising at least one hydrotreatment catalyst.
- 15 2. Method according to claim 1 in which the temperature of the stream entering the first catalytic zone of the first hydrotreatment stage a), said stream being constituted by the mixture of the feed obtained from a renewable source and of the petroleum feed, is comprised between 180 and 220°C.
- 20 3. Method according to one of claims 1 or 2 in which the active phase of said catalyst is constituted by at least one group 6 element, said group 6 element being molybdenum and at least one group 8 to 10 element, said group 8 to 10 element being nickel.
4. Method according to one of claims 1 to 3 in which in the case when the catalyst is in the
25 supported form, the oxide content of group 6 element is comprised between 1 and 30 wt.% relative to the total weight of the catalyst and the oxide content of group 8 to 10 element is

strictly greater than 0% and less than 1.5 wt.% of oxide relative to the total weight of the catalyst.

5. Method according to one of claims 1 to 4 in which the first hydrotreatment stage a) is a stage of hydrogenation of the unsaturations of the fatty acid chains of the triglycerides and hydrodeoxygenation of the feed.

6. Method according to one of claims 1 to 5 in which the first hydrotreatment stage a) operates at a temperature comprised between 120 to 450°C, at a total pressure comprised between 1 and 10 MPa, at an hourly space velocity comprised between 0.1 and 10 h⁻¹ and at a hydrogen/feed ratio expressed as volume of hydrogen, measured under normal conditions of temperature and pressure, per volume of liquid feed generally comprised between 50 NI/l and 3000 NI/l.

7. Method according to one of claims 1 to 6 in which the selectivity for hydrodeoxygenation (HDO) of the first hydrotreatment stage a) is greater than 95%.

8. Method according to one of claims 1 to 7 in which the effluent from the first hydrotreatment stage a) is sent directly, without an intermediate stripping stage, to the second hydrotreatment stage b).

9. Method according to one of claims 1 to 8 in which the temperature of the effluent leaving the first hydrotreatment stage a) is above 300°C.

10. Method according to one of claims 1 to 8 in which the hydrotreatment catalyst used in the second hydrotreatment stage b) comprises nickel as group 8 to 10 element and molybdenum as group 6 element and said catalyst comprises a content of nickel oxide comprised between

0.5 and 10 wt.% and a content of molybdenum trioxide comprised between 1 and 30 wt.% on an alumina amorphous mineral support, the percentages being expressed in wt.% relative to the total weight of the catalyst.

5 11. Method according to one of claims 1 to 10 in which the hydrotreated effluent is subjected to a stage of separation of water and of at least one liquid hydrocarbon base.

12. Method according to one of claims 1 to 11 in which all of the hydrotreated liquid effluent is then subjected to a hydroisomerization stage in the presence of a selective
10 hydroisomerization catalyst.

13. Method according to one of claims 1 to 12 in which the petroleum feeds are selected from the group comprising atmospheric gas oils from direct distillation, gas oils obtained from conversion processes, and the feeds obtained from renewable sources are selected from oils
15 and fats of vegetable or animal origin, or mixtures of said feeds, containing triglycerides and/or free fatty acids and/or esters.

14. Method according to one of claims 1 to 13 in which the mixture of conventional petroleum feed and feed from a renewable source is constituted by 60 to 99 wt.% of conventional
20 petroleum feed and 1 to 40 wt.% of feed from a renewable source.