CLAIMS

1. Process for treating a hydrocarbon feedstock having a sulfur content of at least 0.5% by weight, an asphaltene content of at least 2% by weight, a content of nickel and vanadium metals is greater than 110 ppm an initial boiling point of at least 340°C and a final boiling point of at least 440°C, which makes it possible to obtain at least one liquid hydrocarbon fraction with a sulfur content of less than or equal to 0.5% by weight, comprising the following successive steps:

a) a step of fixed-bed hydrotreatment, wherein the hydrocarbon feedstock and hydrogen are placed in contact over at least one hydrotreatment catalyst, wherein the hydrotreatment step (a) comprises a first step (a1) of hydrodemetallation (HDM) performed in one or more fixed-bed hydrodemetallation zones and a subsequent second step (a2) of hydrodesulfurization (HDS) performed in one or more fixed-bed hydrodesulfurization zones, and wherein the hydrodemetallation (HDM) performance in the fixed-bed hydrodemetallation zone(s) is greater than 80%,

b) a step of hydroconversion of at least part of the effluent derived from step (a) in at least one ebullated-bed reactor containing a supported catalyst, and

c) a step of separation of the effluent derived from step (b) to obtain at least one gaseous fraction and at least the said liquid hydrocarbon fraction,

without an intermediate separation step between the hydrotreatment step (a) and the hydroconversion step (b).

2. Process according to Claim 1, wherein the hydrotreatment step (a) is performed at a temperature of between 300°C and 500°C, at an absolute pressure of between 2 MPa and 35 MPa, with an hourly space velocity of the hydrocarbon feedstock which is within a range from 0.1 h^{-1} to 5 h^{-1}, and the amount of hydrogen mixed with the feedstock is between 100 Nm^3/m^3 and 5000 Nm^3/m^3.

3. Process according to any one of Claims 1 to 2, wherein the hydroconversion step (b) is performed at an absolute pressure of between 2.5 MPa and 35 MPa, at a temperature of between 330°C and 550°C, with an hourly space velocity which is in a range from 0.1 h^{-1} to 10 h^{-1}, and the amount of hydrogen mixed with the feedstock is from 50 Nm^3/m^3 to 5000 Nm^3/m^3.

4. Process according to any one of Claims 1 to 3, wherein the hydrotreatment step (a) is performed in one or more fixed-bed hydrotreatment zones preceded by at least two hydrotreatment guard zones which are also in fixed beds, arranged in series so as to be used in a cyclic manner consisting of the successive repetition of steps a'') and a''') defined below:

a') a step wherein the guard zones are all used together for a duration that is at most equal to the deactivation and/or clogging time for one of them,

a'') a step wherein the deactivated and/or clogged guard zone is short-circuited and the catalyst it contains is regenerated and/or replaced with fresh catalyst, and during which the other guard zone(s) are used, and

a''') a step wherein the guard zones are all used together, the guard zone whose catalyst has been regenerated and/or replaced during the preceding step being reconnected and the said step being continued for a duration at most equal to the deactivation and/or clogging time of one of the guard zones.

5. Process according to any one of Claims 1 to 4, wherein the hydrocarbon feedstock is chosen from atmospheric residues, crude petroleums, de-headed crude petroleums, deasphalting resins, deasphalting pitches or asphalts, bituminous sands or derivatives thereof, bituminous shales or derivatives thereof, parent-rock oils or derivatives thereof, taken alone or as a mixture.

6. Process according to any one of Claims 1 to 5, wherein the separation step (c) also comprises at least one atmospheric distillation, wherein the liquid hydrocarbon fraction(s) obtained after separation are fractionated by atmospheric distillation into at least one atmospheric distillate fraction and at least one atmospheric residue fraction.

7. Process according to any one of Claims 1 to 6, wherein the separation step (c) also comprises at least one vacuum distillation in which the liquid hydrocarbon fraction(s) obtained after separation and/or the atmospheric residue fraction obtained after atmospheric distillation are fractionated by vacuum distillation into at least one vacuum distillate fraction and at least one vacuum residue fraction.

8. Process according to Claim 7, wherein at least part of the vacuum residue fraction is recycled into the hydroconversion step (b).

9. Process according to any one of Claims 6 to 8, also comprising a step (d) of separating out sediments and fines, wherein at least part of the atmospheric residue fraction and/or vacuum distillate fraction and/or vacuum residue fraction is subjected to a separation of the catalyst fines and sediments, using at least one filter, a centrifugation system or on-line decantation.

10. Process according to any one of Claims 7 to 9, also comprising a catalytic cracking step (e), wherein at least part of the vacuum distillate fraction and/or of the vacuum residue fraction, which has optionally been subjected beforehand to the step for separating out the sediments and fines (d), is sent to a catalytic cracking section in which it is treated under conditions enabling the production of a gaseous fraction, a petroleum fraction, a diesel fraction and a residual fraction.

11. Process according to any one of Claims 6 to 10, wherein the atmospheric residue and/or the vacuum distillate and/or the vacuum residue obtained after the separation step (c), which has optionally been subjected beforehand to the step (d) for separating out the sediments and fines, are mixed with one or more flux bases chosen from the group consisting of light cycle oils from a catalytic cracking, heavy cycle oils from a catalytic cracking, the residue of a catalytic cracking, a kerosene, a gas oil, a vacuum distillate and/or a decanted oil.

12. Process according to Claim 11, wherein the said flux base is chosen from part of the diesel fraction and/or of the residual fraction obtained from the catalytic cracking step (e).

13. Process according to claim 9 wherein the fuel oil produced has a sediment content of less than or equal to 0.1% by weight.

14. Process according to any one of claims 11 to 12 wherein the fuel oil produced has a viscosity between 1 cSt and 700 cSt at 50°C.

15. Process according to any one of claims 1 to 14 wherein the fuel oil produced has a sulfur content of less than or equal to 0.3% by weight, more preferentially less than or equal to 0.1% by weight and even more preferentially less than or equal to 0.08% by weight.

16. Process according to any one of claims 1 to 15 wherein the fuel oil produced meets the specification of standard ISO 8217:2012.