Claims

1. A process for the purification of an organic composition (OC1) by adsorption using an assembly containing at least two adsorbers comprising the following steps a) to c):

a) the organic composition (OC1) comprising at least one alkane and/or at least one olefin and at least one compound containing oxygen and/or sulphur is fed into a first adsorber (A1) of the assembly in order to obtain an organic composition (OC2) comprising at least one alkane, at least one olefin and a reduced amount of at least one compound containing oxygen and/or sulphur compared to the respective amount in organic composition (OC1),

b) hydrogenation of at least a part of the organic composition (OC2) obtained in step a) to obtain a stream (S2) comprising at least one alkane and a reduced amount of at least one olefin compared to the respective amount in organic composition (OC2),

c) regenerating a second adsorber (A2) of the assembly by contact with stream (S2) obtained in step b), wherein the purification employing the first adsorber (A1) of the assembly according to step a) and the regeneration of the second adsorber (A2) of the assembly according to step c) are run in parallel.

2. The process according to claim 1, wherein

i) the respective organic composition subjected to hydrogenation in step b) comprises butane and butene, and/or

ii) the respective organic composition subjected to hydrogenation in step b) comprises < 20 wt-ppm of at least one compound containing oxygen and/or sulphur, and/or

iii) the stream (S2) comprises not more than 1000 wt-ppm olefin, and/or

iv) the stream (S2) comprises at least 99 wt-% of at least one alkane, and/or

v) the stream (S2) comprises < 20 wt-ppm of at least one compound containing oxygen and/or sulphur, and/or

vi) the load of the adsorber (A1) with organic composition (OC1) in step a) is 10 to 100 t/h, and/or

vii) the organic composition (OC1) is fed into the adsorber (A1) in step a) at a temperature of 25 to 40°C, and/or

viii) the organic composition (OC1) is fed into the adsorber (A1) in step a) at a pressure of 5 to 8 bar.

3. The process according to claim 2, wherein in (i) the wt-% of butane and butene is at least 96 wt-% butane and not more than 4 wt-% butane.

4. The process according to claim 2 or claim 3, wherein in (iii) the wt-ppm olefin is not more than 500 wt-ppm.

5. The process according to claim 4, wherein in (iii) the wt-ppm olefin is butene.

6. The process according to any one of claims 2 to 5, wherein in (iii) the olefin is not more than 100 wt-ppm.

7. The process according to any one of claims 2 to 6, wherein in (iv) the wt-% of the at least one alkane is at least 99.5 wt-%.

8. The process according to claim 7, wherein in (iv) the wt-% of the at least one alkane is at least 99.9 wt-%.

9. The process according to any one of claims 2 to 8, wherein in (iv) the at least one alkane is butane.

10. The process according to any one of the preceding claims, wherein the organic composition (OC1) comprises at most 1000 wt-ppm of at least one compound containing oxygen and/or sulphur.

11. The process according to any one of the preceding claims, wherein the organic composition (OC1) comprises butane and butene.

12. The process according to any one of the preceding claims, wherein the organic composition (OC1) the ratio of alkane to olefin is 0.5:1 to 2:1 [weight-%:weight-%].

13. The process according to any one of the preceding claims, wherein the at least two adsorbers (A1) and (A2) are based on a molecular sieve or aluminium oxide, and/or the adsorbers can be employed for the adsorption of compounds containing oxygen and/or sulphur out of organic compositions.

14. The process according to claim 13, wherein the adsorbers can be employed for the adsorption of ethers, alcohols, thiols, thioethers, sulfoxides, ketones, aldehydes or mixtures thereof.

15. The process according to any one of the preceding claims, wherein the time for regeneration and purification is equal.

16. The process according to claim 15, wherein the time for regeneration and purification is in the range of 12 to 48h.

17. The process according to any one of the preceding claims, wherein step c) comprises at least one of the following component steps c1) to c6):

c1) converting stream (S2) from liquid into gaseous phase,

c2) heating the adsorber by contact with the gaseous stream (S2), wherein the gaseous stream (S2) is condensed within the adsorber,

c3) heating the adsorber by contact with the gaseous stream (S2) up to a temperature in the range of 230 to 270°C without any condensation of the gaseous stream (S2) within the adsorber,

c4) regeneration of the adsorber at a temperature in the range of 230 to 270°C by contact with the gaseous stream (S2),

c5) cooling of the adsorber by contact with the gaseous stream (S2) to a temperature in the range of 80°C to 120°C, and/or

c6) cooling of the adsorber by contact with the liquid stream (S2) obtained in step a) to a temperature below 80°C.

18. The process according to claim 17, wherein in component step (c6), the temperature is in the range of 40 to 60°C.

19. The process according to claim 16 or claim 17, wherein step d) according to claim 9 is carried out prior to step c) and step c) comprises the component steps c1), followed by c2), followed by c3), followed by c4), followed by c5) and followed by c6).

20. The process according to any one of the preceding claims, wherein prior to carrying out step c) a draining step d) is carried out in order to at least partially remove an organic composition (OC1) and/or (OC2) which was passed through the second adsorber during its operation mode.

21. The process according to any one of claims 17 to 20, wherein the condensate obtained in step c2) contains the stream (S2) and the residue of the organic composition (OC1) and/or (OC2) which was not removed from the adsorber (A2) when carrying out draining step d), and the condensate is optionally collected in a device, in order to pass the collected condensate through an adsorber during its operation mode.

22. The process according to claim 21, wherein the device is a buffer vessel.

23. The process according to any one of claims 17 to 20, wherein in step c1) the conversion is carried out by employing at least one evaporator and/or at least one superheater and/or at least one flash vessel.

24. The process according to any one of the preceding claims, wherein prior to step b), an additional step e) is carried out, comprising

e) oligomerization of organic composition (OC2), wherein at least one of the olefins is at least partially oligomerized, obtaining an organic composition (OC3) comprising an reduced amount of at least one olefin and an increased amount of at least one oligomerized olefin compared to the respective amounts in (OC2), with use of (OC3) rather than (OC2) in the subsequent steps.

25. The process according to claim 24, wherein the oligomerization is a dimerization.

26. The process according to claim 24 or claim 25, wherein butene is at least partially dimerized to octene.

27. The process according to any one of claims 24 to 26, wherein prior to step b) and after step e) an additional step f) is carried out, comprising

f) distillation of organic composition (OC3) in a distillation column (D1), wherein

i) an organic composition (OC4) is obtained from the upper part of (D1) and (OC4) comprises at least one alkane, at least one olefin and an reduced amount of at least one oligomerized olefin compared to the respective amount in (OC3), with the use of (OC4) rather than(OC3) in the subsequent steps,

ii) a stream (S3) is obtained from the lower part of (D1) and (S3) comprises at least 80 % by weight.

28. The process according to claim 27, wherein (S3) comprises butene is at least partially dimerized to octene.

29. The process according to any one of the preceding claims, wherein prior to step b) an additional step g) is carried out, comprising

f) distillation of organic composition (OC2), or optionally of organic composition (OC3) or optionally of organic composition (OC4) in a distillation column (D2), wherein

i) an organic composition (OC2a) is obtained from the upper part of (D2) and (OC2a) comprises at least one alkane and an reduced amount of at least one olefin compared to the respective amount in (OC2), (OC3) or (OC4), with use of (OC2a) rather than (OC2), (OC3) or (OC4) in the subsequent steps,

ii) a stream (S4) is obtained from the lower part of (D2) and (S4) comprises at least 80 % by weight of the olefins present in (OC2), (OC3) or (OC4).

30. The process according to claim 29, wherein (S4) comprises at least 90 % by weight of the olefins present in (OC2), (OC3) or (OC4).

31. The process according to claim 29 or claim 30, wherein step e) is carried out prior to step f), step f) is followed by step g) and step g) is followed by step b).

32. The process according to any one of claims 27 to 31, wherein distillation column (D1) and/or distillation column (D2) serve the purpose of removing iso-butane and the respective organic composition fed into (D1) and/or (D2) comprises butane and/or butene.