CLAIMS

1. Process to prepare propylene from a mixture of hydrocarbons having an olefin content of between 5 and 50 wt.% and boiling for more than 90 vol.% between 35 and 280 °C or from a hydrocarbon feed comprising paraffins, naphthenics and/or aromatics and optionally up to 10 wt.% of olefins, wherein the process comprises the following steps:
(a) feeding the mixture of hydrocarbons optionally in admixture with a recycle stream and having a temperature between 450 and 750 °C to a reactor where the feed is contacted with a low acidic density cracking catalyst at a hydrocarbon partial pressure of below 3 bar and at a weight hourly space velocity of between 0.5 and 100 h^{-1},
(b) isolating propylene and optionally other low boiling compounds from the effluent of step (a) wherein a first high boiling fractions remains,
(c) feeding all or part of the first high boiling fraction optionally in admixture with a recycle stream and having a temperature between 400 and 750 °C to a reactor where the first high boiling fraction is contacted with a high acidic density cracking catalyst at a hydrocarbon partial pressure of below 3 bar and at a weight hourly space velocity of between 0.5 and 100 h^{-1} and wherein the temperature of the mixture of hydrocarbons optionally in admixture with a recycle stream as fed to the reactor in step (a) is lower than the temperature of the first high boiling fraction optionally in admixture with a recycle stream as fed to the reactor in step (c),
(d) isolating propylene and optionally other low boiling compounds from the effluent of step (c) wherein a second high boiling fractions remains, and
(e) recycling all or part of the second high boiling fraction to step (a) and/or to step (c) as the optional recycle stream.

2. Process according to claim 1, wherein the weight hourly space velocity in step (a) is greater than the weight hourly space velocity in step (c).

3. Process according to any one of claims 1-2, wherein part of the first high boiling fraction and/or all or part of the second high boiling fraction is contacted in a step (f) with hydrogen in the presence of an aromatic conversion catalyst as present in a reactor to obtain a fraction rich in aromatics and wherein all or part of the fraction rich in aromatics is recycled to step (c) as an optional recycle stream and/or to step (f).

4. Process according to claim 3, wherein contacting in step (f) takes place at a temperature of between 400 and 700 °C, at a weight hourly space velocity of between 0.1 and 50 h^{-1}, a hydrocarbon partial pressure below 10 bar and a hydrogen partial pressure below 10 bars.

5. Process according to any one of claims 3-4, wherein the aromatic conversion catalyst is a heterogenous catalyst comprising ZnO, a medium pore zeolite and a binder.

6. Process according to any one of claims 1-5, wherein the low acidic density catalyst is an amorphous catalyst.

7. Process according to any one of claims 1-5, wherein the low acidic density catalyst in step (a) is a heterogenous catalyst comprising a medium or large pore zeolite having a silica to alumina ratio of between 2 and 1000.

8. Process according to claim 7, wherein the heterogenous catalyst comprises up to 70 wt.% ZSM-5, between 1-20 wt.% P_2O_5 and a binder.

9. Process according to clam 8, wherein the heterogenous catalyst comprises between 25 and 80 wt.% ZSM-5.

10. Process according to any one of claims 1-8, wherein the weight hourly space velocity in step (a) is between 0.5 and 50 h^{-1}.

11. Process according to any one of claims 1-9, wherein the high acidic density catalyst in step (c) is a heterogenous catalyst comprising up to 80 wt.% ZSM-5 having a silica to alumina ratio of between 2 and 1000, between 1-20 wt.% P_2O_5 and a binder.

12. Process according to any one of claims 7-10 and claim 11, wherein the silica to alumina ratio of the high acidic density catalyst is lower than the silica alumina ratio of the low acidic density catalyst.

13. Process according to clam 12, wherein the heterogenous catalyst comprises between 35 and 50 wt.% ZSM-5.

14. Process according to any one of claims 1-13, wherein the weight hourly space velocity in step (c) is between 1 and 50 h^{-1}.

15. Process according to any one of claims 1-14, wherein the hydrocarbon partial pressure excluding aromatics in steps (a) and (c) is below 1 bar.

16. Process according to any one of claims 1-15, wherein the mixture of hydrocarbons comprises a fraction as isolated from the effluent of a Fluid Catalytic Cracking process and/or isolated from the effluent of a steam cracker process.

17. Process according to any one of claims 1-16, wherein the content of aromatic compounds in the hydrocarbon mixture including optional recycle streams as fed to the reactor in step (c) is between 10 and 80 wt.%.

18. Process according to any one of claims 1-17, wherein part of the second high boiling fraction as obtained in step (d) is recycled to step (c) as the recycle stream.

19. Process according to 18, wherein in step (d) propylene and other low boiling compounds are isolated from the effluent of step (c) in a debutanizer distillation column which is operated under partial vacuum and wherein the second high boiling fraction is obtained as a bottom product of the debutanizer distillation column.

20. Process to prepare propylene from a hydrocarbon feed comprising paraffins, naphthenics and/or aromatics and optionally up to 10 wt.% of olefins wherein the process comprises the following steps:
(aa) feeding the feed in admixture with a recycle stream and having a temperature of between 450 and 700 ^{o}C to a continuously operated fixed bed reactor comprising a high acidic density cracking catalyst where the mixture is contacted with a high acidic density cracking catalyst at a hydrocarbon partial pressure, excluding aromatics, of below 3 bar and at a weight hourly space velocity of between 1 and 30 h^{-1},
(bb) isolating propylene and optionally other low boiling compounds from the effluent of step (aa) wherein a high boiling fractions remains,
(cc) recycling part of the high boiling fraction to the reactor of step (aa) wherein the total content of aromatics in the combined mixture as fed to the fixed bed reactor in step (aa) is maintained at between 5 and 30 wt.%, optionally by additionally feeding an aromatic comprising further hydrocarbon mixture to the fixed bed reactor.

21. Process according to 20, wherein in step (bb) propylene and other low boiling compounds are isolated from the effluent of step (aa) in a distillation column which is operated under partial vacuum and wherein the high boiling fraction is obtained as a bottom product of the distillation column.

22. Process according to any one of claims 20-21, wherein the high acidic density catalyst in step (aa) is a heterogenous catalyst comprising up to 80 wt.% ZSM-5 having a silica to alumina ratio of between 2 and 1000, between 1-20 wt.% P_2O_5 and a binder.

23. Process according to any one of claims 20-22, wherein part of the high boiling fraction is contacted in a step (dd) with hydrogen in the presence of an aromatic conversion catalyst as present in a reactor to obtain a fraction rich in aromatics and wherein all or part of the fraction rich in aromatics is recycled to step (aa) as the further hydrocarbon mixture.

24. Process according to claim 23, wherein contacting in step (dd) takes place at a temperature of between 400 and 550 °C, at a weight hourly space velocity of between 0.5 and 5 h-1, a hydrocarbon partial pressure below 10 bar and a hydrogen partial pressure below 10 bars.

25. Process according to any one of claims 23-24, wherein the aromatic conversion catalyst is a heterogenous catalyst comprising ZnO, a medium pore zeolite and a binder.