Claims

1. A reactive rectification system for the production of high-octane components of petrol, comprising a rectification column having a feed zone and hydrogen-bearing gas supply zone, the system also contains a minimum of three reaction zones, at least one of which is a benzene hydroisomerisation zone, at least another of which is a hexane isomerisation zone and at least another of which is a pentane isomerisation zone, moreover the benzene hydroisomerisation zone is located below all the other reaction zones and is situated in the lower part of the column, the hexane isomerisation zone is situated above the feed zone and below the pentane isomerisation zone, the system also contains at least one side draw situated above the hexane isomerisation zone and below the pentane isomerisation zone.

2. The system according to cl. 1, where all three reaction zones are situated inside the rectification column.

3. The system according to cl. 2, which contains four distillation zones in such a way that all the reaction zones are separated by distillation zones.

4. The system according to cl. 1, where the feed zone is situated above the benzene hydroisomerisation zone.

5. The system according to cl. 1, where each reaction zone has a dedicated hydrogen supply zone.

6. The system according to cl. 1, where the catalyst of the lower hydroisomerisation zone is zeolite coated with a Group VIII metal.

7. The system according to cl. 1, where the catalyst of upper isomerisation zones is a Group IV metal oxide coated with a Group VIII metal and promoted by sulphate and (or) tungstate ions.

8. A method of producing high-octane components of petrol, wherein the feed flow is supplied to the feed zone of the reactive rectification column, being a part of the reactive rectification system, containing a minimum of three reaction zones, at least one

of which is a benzene hydroisomerisation zone, at least another of which is a hexane isomerisation zone and at least another of which is a pentane isomerisation zone. Benzene hydroisomerisation occurs in the benzene hydroisomerisation zone situated in the lower part of the column below all the other reaction zones. Hexane isomerisation occurs in the hexane isomerisation zone situated above the feed zone and below the pentane isomerisation zone. Pentane isomerisation occurs in the pentane isomerisation zone, moreover isohexanes are recovered from the side draw of the column situated above the hexane isomerisation zone and below the pentane isomerisation zone, isopentanes are recovered from the top of the column, and cyclopentanes are recovered from the bottom of the column.

9. The method according to cl. 8, wherein the feed flow temperature is such that the flow is vapour-liquid, with benzene advantageously in liquid phase.

10. The method according to cl. 9, where the feed flow is delivered into the column distillation zone situated between the isomerisation and hydroisomerisation zones.

11. The method according to cl. 10, wherein the feed flow is separated into two flows when entering the column, one of which is descending and contains benzene and components with a higher molecular mass, and the second flow is ascending and contains components with a molecular mass lower than the molecular mass of benzene.

12. The method according to cl. 10, where C4-C6 alkanes are delivered from the feed flow to the isomerisation reaction zone situated above the feed flow inlet point, whereas aromatics, cycloalkanes and C7 alkane hydrocarbons and heavier feeds are delivered to the hydroisomerisation reaction zone situated below the feed flow inlet point.

13. The method according to cl. 8, wherein isomerisation reactions occur in reaction zones outside of the column, and the product mixture is returned to the column.

14. The method according to cl. 8, wherein hydrocarbons and hydrogen are mixed directly in the reaction zone, furthermore hydrogen is delivered to each zone separately.

15. The method according to cl. 8, where the feed flow consists of a fraction of

C4-C8 hydrocarbons containing benzene at a level of up to 30 % by mass.

16. The method according to cl. 8, where benzene hydroisomerisation occurs by using a catalyst of zeolite coated with a Group VIII metal.

17. The method according to cl. 8, where isomerisation occurs on a catalyst of a Group IV metal oxide coated with a Group VIII metal and promoted by sulphate and (or) tungstate ions.

18. The method according to cl. 8, where the hydrogen : hydrocarbon molar ratio comprises between 0.01 and 5 to 1, preferably between 0.01 and 3 to 1, more preferably between 0.1 and 3 to 1, and yet more preferably between 0.08 and 1.5 to 1.

19. The method according to cl. 8, where the column pressure is in the range of 10 to 40 atm gauge, and preferably between 30 and 35 atm gauge.

20. The method according to cl. 8, where the column temperature is in the range of 80 to 350°C, preferably between 80 and 300°C, and more preferably between 150 and 280°C.

21. The method according to cl. 8, where the temperature in the upper part of the column is in the range of 80 to 220°C, preferably between 150 and 200°C, whereas the temperature in the lower part of the column is in the range of 120 and 350°C, preferably between 220 and 280°C.

22. The system according to cl. 1, to produce high-octane components of petrol from benzene-containing feedstock.

CLAIMS:

1. A method of hydroizomerization and isomerization of C4-C8 hydrocarbon fractions during simultaneous chemical reaction and distillation, the method comprising:

feeding a fraction of C4-C8 hydrocarbons into a distillation zone column disposed between an isomerization reaction zone reactor and a hydroisomerizarion reaction zone reactor, the hydrocarbons comprising from about 0% to about 30% mass of benzene;

supplying paraffin C4-C6 hydrocarbon from a feed of a reaction-rectification column to an isomerization reaction zone disposed higher than the feed;

supplying aromatic, naphthenic and paraffin hydrocarbons C7 and heavier from the feed of the reaction-rectification column to a hydroisomerization reaction zone disposed lower than the feed;

feeding paraffin hydrocarbons C5 and lighter from a distillation zone disposed between the izomerization reaction zone and the hydroisomerization reaction zone into a second isomerization zone disposed higher than a lateral selector of the reaction-rectification column;

obtaining C5 and heavier paraffin hydrocarbons by a stream out of the top of the reaction-rectification column, then condensing the stream and blowing off a hydrogen-containing gas;

obtaining C6 paraffin hydrocarbons of a normal and iso-structures from a stream out of the lateral selector of the reaction-rectification column; and

obtaining C6 and heavier naphtenic hydrocarbons and C7 and heavier hydrocarbons from a stream out of the bottom of the reaction-rectification column.

2. The method of claim 1, comprising performing the isomerization reaction and the hydroisomerization reaction in three catalytic zones inside the reaction-rectification column.

3. The method of claim 1, comprising performing the isomerization reaction in catalytic zones outside of the reaction-rectification column, wherein a stream from a catalytic zone outside of the reaction-rectification column returns to the column for separation and return of the non-reacted components.

4. The method of claim 1, wherein at least one reaction zone is disposed inside the reaction-rectification column.

5. The method of claim 1, further comprising hydroisomerizing of benzene in a lower reaction zone of the column.

6. The method of claim 1, further comprising mixing of hydrogen and hydrocarbons in a reaction zone, wherein the hydrogen is separately supplied to each reaction zone in varying quantities.

7. The method of claim 1, further comprising selectively isomerizing C6 hydrocarbons by contacting them with hydrogen on a catalyst in the isomerization reaction zone dispose between the feed of the reaction-rectification column and the lateral selector.

8. The method of claim 1, further comprising selectively hydroisomerizing aromatic hydrocarbons by contacting them with hydrogen on a hydroisomerization catalyst in a hydroisomerization reaction zone disposed lower than the feed of the reaction-rectification column.

9. The method of claim 1, further comprising selectively isomerizing C5 hydrocarbons by contacting them with hydrogen on an isomerization catalyst in an isomerization reaction zone disposed in an

upper portion of the reaction-rectification column.

10. The method of claim 1, wherein the stream out of the top of the reaction-rectification column comprises isopentane.

11. The method of claim 1, wherein the stream out of the lateral selector of the reaction rectification column comprises isohexanes, including 2-,3-methylpentanes, 2,2-,2,3-dimethylbutanes.

12. The method of claim 1, wherein the stream out of the bottom of the reaction-rectification column comprises cyclohexane and methylcyclopentane.

13. The method of claim 1, wherein a pressure in the reaction-rectification column is in a range from about 10 atm to about 40 atm.

14. The method of claim 1, wherein a temperature of the reaction-rectification column is in a range from about 80° C. to about 300° C.

15. The method of claim 1, wherein hydrocarbons are mixed with hydrogen in a molar ratio of hydrogen to hydrocarbons is in a range from about 0.1 to 1 to about 3 to 1.

16. The method of claim 1, further comprising using a group VIII metal deposited on a zeolite as a catalyst in a lower hydroisomerization zone.

17. The method of claim 1, further comprising using a group VIII metal deposited on a group IV metal oxide as a catalyst, which is enhanced with sulfate and/or tungsten ions.