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71 Applicant: **SHELL INTERNATIONALE  
RESEARCH MAATSCHAPPIJ B.V.**  
**Carel van Bylandtlaan 30  
NL-2596 HR Den Haag(NL)**

72 Inventor: **Lucien, Jacques**  
**Carel van Bylandtlaan 30  
NL-2596 HR The Hague(NL)**  
Inventor: **Thielemans, Gerardus Leonardus  
Bosco**  
**Carel van Bylandtlaan 30  
NL-2596 HR The Hague(NL)**

54 **Hydrodecyclization process.**

57 Process for reducing the amount of cyclic structures present in a gas oil, which process comprises contacting a gas oil with hydrogen at elevated temperature and pressure using a catalyst comprising one or more Group VIII noble metal(s) on a support wherein the support comprises a modified Y-type zeolite.

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The present invention relates to a process for reducing the amount of cyclic structures present in a gas oil.

It is well known that hydrocarbon oil products have to fulfil certain chemical and physical requirements if they are to be commercially applied. One of the requirements a gas oil has to meet is the cetane index.

5 Compounds contributing favourably to the cetane index are paraffins. Naphthenes contribute less favourably to the cetane index, while aromatics are even less desirable from that point of view. Several processes are known for increasing the cetane index of a given gas oil, such as hydrocracking and hydrogenation. Hydrocracking has as a disadvantage that part of the feed is converted into undesired lighter products. Hydrogenation comprises conversion of olefinic compounds, in particular aromatic compounds,  
10 into the corresponding saturated compounds. The optimum cetane index which is possible for a given gas oil without substantial cracking of molecules, will not be attained in this way.

Further, it is important from an environmental point of view to produce a gas oil comprising a small amount of aromatics.

15 It has now been found that a gas oil of good cetane index and low aromatics content can be obtained in a commercially attractive way by subjecting the gas oil to a specific process for reducing the amount of cyclic structures in a gas oil. In such process, the cetane index of the compounds present are optimized while hydrocracking of the hydrocarbons, whereby undesirable lighter products are produced, is substantially prevented.

20 The present invention relates to a process for reducing the amount of cyclic structures present in a gas oil, which process comprises contacting a gas oil with hydrogen at elevated temperature and pressure using a catalyst comprising one or more Group VIII noble metal(s) on a support wherein the support comprises a modified Y-type zeolite having a unit cell size between 24.20 and 24.40 Å and a SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> molar ratio of between 10 and 150 and recovering a gas oil comprising a reduced amount of cyclic structures.

25 With gas oil is meant a hydrocarbon oil comprising mainly hydrocarbons boiling in the range between 170 and 390 °C and containing at least 25% by weight of hydrocarbons boiling in the range between 250 and 390 °C, which hydrocarbon oil further has a cetane index between 38 and 49. Suitably a relatively light gas oil is used, i.e. mainly comprising hydrocarbons boiling in the range between 170 and 320 °C. Preferably, hydrotreated gas oils are used as these have a relatively low nitrogen and sulphur content which contributes favourably to the life time of the catalyst.

30 Hydrodecyclization is understood to comprise reduction of the amount of cyclic structures present in the gas oil. Preferably, the amount of cyclic structures present is reduced with at least 10%, based on amount of cyclic structures present in the feed preferably with at least 15%. No substantial cracking takes place, which means that the gas oil recovered from the process according to the present invention comprises at least 5% by weight of hydrocarbons boiling in the range between the 90% by weight boiling  
35 point of the feed gas oil and the final boiling point of the feed gas oil.

In the process according to the present invention use is made of a catalyst comprising one or more Group VIII noble metal(s). Metals which can be suitably present are platinum and/or palladium. Preferably, the catalyst comprises between 0.05 and 3% by weight of noble metal(s) based on amount of zeolite. More preferably, the catalyst comprises platinum and palladium in a molar ratio of between 0.25 and 0.75.

40 The catalyst further comprises a support comprising a modified Y-type zeolite having a SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> molar ratio of between 10 and 150. It has been found that catalysts comprising a relatively low SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> molar ratio give surprisingly good results. A molar ratio which is preferred is between 15 and 50, more specifically between 20 and 45. The unit cell size of the Y-type zeolite applied is between 24.20 and 24.40 Å, more specifically between 24.22 and 24.35.

45 The hydrodecyclization process can suitably be carried out at a temperature between 150 and 400 °C, preferably at a temperature between 250 and 380 °C. The hydrogen partial pressure applied will usually be between 10 and 150 bar, preferably between 30 and 100 bar.

In the present process the catalyst, temperature and pressure will generally be chosen in such combination that a gas oil is produced having a cetane index of more than 45, preferably more than 50, and  
50 comprising less than 25% by weight of aromatic compounds, preferably less than 20. It was found that even gas oils having a cetane index of more than 50 and comprising less than 5% by weight of aromatic compounds, so-called "green gas oils", can be produced in the present process. The cetane index is measured according to ASTM D976.

55 The characteristics of the gas oil produced depend on the feed gas oil and the process conditions. The cetane index and aromatic content which are aimed at in commercial operation, are determined by economic considerations.

The process of the present invention will be further elucidated by the following example.

EXAMPLE

A hydrotreated straight run gas oil as described in Table 1, was contacted with a catalyst comprising Y-type zeolite having a unit cell size of 24.24 Å and a SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> molar ratio of 40 and containing 0.3% by weight of platinum and 0.5% by weight of palladium, based on amount of zeolite, at a temperature of 265 °C, a hydrogen partial pressure of 35 bar and a weight hourly space velocity of 1.4 ton/m<sup>3</sup>.hour.

The results obtained are shown in Table 2.

The amount of cyclic structures present in the product obtained was reduced with 18%, based on amount of cyclic structures present in the feed.

Table 1

Boiling point distribution (° C)	
Initial boiling point	179
10%	205
30%	218
50%	233
70%	249
90%	272
Final boiling point	294
Cetane index	49.3
Aromatics content (% by volume)	20.1

Table 2

Boiling point distribution (° C)	
Initial boiling point	180
10%	205
30%	218
50%	231
70%	247
90%	272
Final boiling point	293
Cetane index	53.4
Aromatics content (% by volume)	3.9

**Claims**

1. Process for reducing the amount of cyclic structures present in a gas oil, which process comprises contacting a gas oil with hydrogen at elevated temperature and pressure using a catalyst comprising one or more Group VIII noble metal(s) on a support wherein the support comprises a modified Y-type zeolite having a unit cell size between 24.20 and 24.40 Å and a SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> molar ratio of between 10 and 150 and recovering a gas oil comprising a reduced amount of cyclic structures.
2. Process according to claim 1, in which the modified Y-type zeolite has a SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> molar ratio of between 15 and 50.
3. Process according to claim 2, in which the modified Y-type zeolite has a SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> molar ratio of between 20 and 45.
4. Process according to any one of the preceding claims, in which the modified Y-type zeolite has a unit cell size of between 24.22 and 24.35 Å.

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5. Process according to any one of the preceding claims, in which the process is carried out at a temperature between 150 and 400 ° C.
- 5 6. Process according to any one of the preceding claims, in which the process is carried out at a hydrogen partial pressure between 10 and 150 bar.
7. Process according to any one of the preceding claims, in which the catalyst comprises platinum and palladium in a molar ratio of between 0.25 to 0.75.
- 10 8. Process according to any one of the preceding claims, in which a gas oil is recovered comprising less than 25% by weight of aromatic compounds and having a cetane index of more than 50.
9. Process according to any one of the preceding claims, in which a gas oil is recovered comprising less than 5% by weight of aromatic compounds and having a cetane index of more than 50.
- 15 10. Hydrocarbons obtained in a process as described in any one of the preceding claims.

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EUROPEAN SEARCH REPORT

Application Number

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	EP-A-0 247 678 (SHELL)  * claims 1,5,15,20,21,22,26,29 * * column 4, line 48 - line 53 * * column 5, line 27 - line 35 *  -----	1, 2, 3, 4, 5, 6, 10	C10G45/64
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			C10G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 28 AUGUST 1992	Examiner OSWALD DE HERDT
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document			

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