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(54) AN ENVIRONMENTAL FRIENDLY LIGHT HYDROCARBON FUEL FOR VEHICLES

(57) The present invention discloses an environmental-friendly vehicle light hydrocarbon fuel, with contents of its components as below according to part by weight: (1) Light hydrocarbon: 100 parts by weight; (2) aromatic hydrocarbon: 4~60 parts by weight; (3) lead free anti-knock: 0~20 parts by weight; (4) cation fluorocarbon surfactant: 0~0.2 parts by weight; and (5) surface active increased superscript agent: 0.001~2 parts by weight. The product of the present invention can increase auto-ignition temperature of the fuel, improve distillation range distribution of the fuel, increase burning velocity of the fuel, enhance power and reduce abrasion of an engine, avoid the formation of piston carbon, and lower consumption of the fuel, with a calorific value ≥ 42000 KJ/kg, being a novel substitute vehicle fuel that is energy saving, environmental-friendly, and cost effective.

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to an environmental-friendly vehicle light hydrocarbon fuel, more particularly, relates to the environmental friendly vehicle light hydrocarbon fuel with the main components being pentane and heavier hydrocarbons that is extracted from condensate of a petrochemical plant or of the natural gas,.

BACKGROUND OF THE INVENTION

[0002] Since August 1, 2006 in China, the two cities, Beijing and Shanghai, have taken the lead in executing the national standard of vehicle pollutant emission (the National III Standard). A vehicle consuming gasoline is not easy to reach the National III Standard because a high boiling component, with a wide distillation range, is inclined to produce CO and HC during combustion. Light hydrocarbon has little emission of CO and HC pollutants because of its low distillation range, low boiling point as well as complete combustion, and thus the limit value of emission (the National III Standard) can be reached.

SUMMARY OF THE INVENTION

[0003] The technical problem to be solved by the present invention is to disclose an environmental-friendly vehicle light hydrocarbon fuel, so as to overcome the above-mentioned shortcomings and environmental pollution problems in the prior art, and satisfy requirements of related aspects.

[0004] The technical problem to be solved by the present invention can be overcomed through the following technical solution:

[0005] An environmental-friendly vehicle light hydrocarbon fuel is provided, which is **characterized in that** contents of the components are as below according to part by weight:

(1) Light hydrocarbon: 100 parts by weight;
(2) Aromatic hydrocarbon: 4~60 parts by weight;
(3) Lead free antiknock: 0~20 parts by weight;
(4) Cation fluorocarbon surfactant: 0~0.2 parts by weight; and
(5) Surface active increased superscript agent: 0.001~2 parts by weight.

[0006] The light hydrocarbon according to the present invention, with the main components being pentane and heavier hydrocarbons, is a fraction extracted from condensate of a petrochemical plant or of the natural gas, with the main components being pentane and heavier hydrocarbons and the RON being 50~80.

[0007] The aromatic hydrocarbon according to the present invention includes toluene, xylene, or hybrid aromatic hydrocarbons for producing toluene.

[0008] The lead free antiknock according to the present invention includes methyl tert-butyl ether (MTBE), tert-amyl methyl ether (TAME), tert-butyl alcohol, isobutanol, and anhydrous methanol or anhydrous ethanol. 1.

[0009] The cation fluorocarbon surfactant according to the present invention, being fluorinated alkyl amine salt or quaternary ammonium salt cation fluorocarbon surfactant, is selected from the substances with a formula (1), (2) or (3) or mixture thereof. The content of the cation fluorocarbon surfactant, is generally 0~0.2 parts by weight, preferably 0~0.1 parts by weight based on 100 parts by weight of the light hydrocarbon.

(1) Quaternary ammonium salt-type cation fluorocarbon surfactant containing fluorinated alkyl amine:

$$(CF_3)_2CF(CF_2)_6CH_2CH(OH)CH_2N^+(CH_3)_3I^-$$

(2) Perfluorinated alkyl amide quaternary ammonium salt-type cation fluorocarbon surfactant:

$$C_7F_{15}CONH(CH_2)_3N^+(CH_3)_3I^-$$

(3) Fluorinated alkyl amine salt type cation fluorocarbon surfactant:

$$[F(CF_2)_8CH(OH)CH_2]_2NCH_2CH_2NH_2\cdot 1/2H_2SO_4$$

[0010] The surface active increased superscript agent according to the present invention is obtained by mixing one of components ① ~ ⑥ and a component ⑦, wherein the content ratio of one of the components ① ~ ⑥ to the component ⑦ is 100:60~80 parts by weight. The content of the surface active increased superscript agent is generally 0.001~2 parts by weight, preferably 0.01~0.2 parts by weight, based on 100 parts by weight of the light hydrocarbon.

① $C_8F_{17}SO_2N(CH_3)CH_2OP(O)(OH)_2$
② $C_8F_{17}SO_2N(CH_3)CH_2OP(O)(ONa)_2$
③ $C_8F_{17}SO_2N(CH_3)CH_2CH_2OP(O)(OH)_2$
④ $C_8F_{17}SO_2N(CH_3)CH_2CH_2OP(O)(ONa)_2$
⑤ $C_8F_{17}SO_2N(C_2H_5)CH_2CH_2OP(O)(OH)_2$
⑥ $C_8F_{17}SO_2N(C_2H_5)CH_2CH_2OP(O)(ONa)_2$
⑦ $C_{17}H_{35}CONH(CH_2)_2NHCOC_{17}H_{35}$

[0011] The method of preparing the environmentally safe vehicle light hydrocarbon fuel according to the present invention is a kind of physical mixing method, which is realized by mixing various raw materials.

[0012] With the surface active increased superscript agent, the environmental friendly light hydrocarbon fuel of the present invention, whose Research Octane Number (RON) is not lower than 93, is suitable for a vehicle engine with various compression ratio, and becomes an environmental friendly vehicle light hydrocarbon fuel.

[0013] The environmental friendly vehicle light hydrocarbon fuel containing the surface active increased superscript agent can increase auto-ignition temperature of the fuel, improve distillation range distribution of the fuel, increase burning rate of the fuel, enhance power and reduce abrasion of an engine, avoid the formation of piston carbon, and lower consumption of the fuel, with a calorific value ≥ 42000 KJ/kg, being a novel substitute vehicle fuel that is energy saving, environmental friendly, and cost effective.

the contents of the exhaust pollutants of the environmental friendly vehicle light hydrocarbon fuel according to the present invention-, are much lower than the GB18352.3-2005 Standard, based on test of contents of the exhaust pollutants CO, HC, and NO_x.

	Unit	Experimental result	National standard requirement of P.R. China
CO	g/km	1.209	≦ 2.3
HC	g/km	0.075	≦ 0.20
NO_x	g/km	0.046	≦ 0.15

[0014] The surface active increased superscript agent can be substituted by the following components ⑧, ⑨, ⑩ or mixture thereof in the environmental friendly vehicle light hydrocarbon fuel according to the present invention, so as to reduce the cost:

⑧ $C_8F_{17}SO_2NHCH_2CH_3$
⑨ $C_8F_{17}SO_3K$
⑩ $C_8F_{17}SO_3N(C_2H_5)_4$

DETAILED DESCRIPTION OF THE EMBODIMENTS

Example 1

[0015]

(1) Light hydrocarbon (the RON is 70): 100 parts by weight;
(2) Toluene: 30 parts by weight;
(3) Cation fluorocarbon surfactant: 0.006 parts by weight; and
(4) Surface active increased superscript agent: 0.05 parts by weight.

[0016] In example 1, the light hydrocarbon is a fraction extracted from condensate of a petrochemical plant or of the natural gas, with the main components being pentane and heavier hydrocarbons.

[0017] In example 1, the cation fluorocarbon surfactant is quaternary ammonium salt-type cation fluorocarbon surfactant containing the fluorinated alkyl amine:

$(CF_3)_2CF(CF_2)_6CH_2CH(OH)CH_2N^+(CH_3)_3I^-$

[0018] In example 1, the surface active increased superscript agent is as below:

③ $C_8F_{17}SO_2N(CH_3)CH_2CH_2OP(O)(OH)_2$

⑦ $C_{17}H_{35}CONH(CH_2)_2NHCOC_{17}H_{35}$

[0019] In example 1, the weight ratio of the surface active increased superscript agent ③ to the component ⑦ is 10:6.
[0020] The product is then obtained by mixing the components (1), (2), (3) and (4), with the Research Octane Number (RON) being 93.

Example 2

[0021]

(1) Light hydrocarbon (the RON is 70): 100 parts by weight;
(2) Xylene: 20 parts by weight;
(3) MTBE: 10 parts by weight;
(4) Cation fluorocarbon surfactant: 0.006 parts by weight; and
(5) Surface active increased superscript agent: 0.09 parts by weight.

[0022] In example 2, the light hydrocarbon is a fraction extracted from condensate of a petrochemical plant or of the natural gas, with the main components being pentane and heavier hydrocarbons.
[0023] In example 2, the cation fluorocarbon surfactant is as below:

Perfluorinated alkyl amide quaternary ammonium salt-type cation fluorocarbon surfactant:

$C_7F_{15}CONH(CH_2)_3N^+(CH_3)_3I^-$

[0024] In example 2, the surface active increased superscript agent is as below:

① $C_8F_{17}SO_2N(CH_3)CH_2OP(O)(OH)_2$

⑦ $C_{17}H_{35}CONH(CH_2)_2NHCOC_{17}H_{35}$

[0025] In example 2, the weight ratio of the surface active increased superscript agent ① to the component ⑦ is 10:6.
[0026] The product is then obtained by mixing the components (1), (2), (3), (4) and (5) in example 2, with the RON being 93.
[0027] The exhaust pollutants of the product of the present embodiment, CO, HC and NO_x, are tested by the test method of GB18352.3-2005, with the test results as below:

	Unit	Experimental result	National standard requirement of P.R. China
CO	g/km	1.209	≦ 2.3
HC	g/km	0.075	≦ 0.20
NO_x	g/km	0.046	≦ 0.15

Example 3

[0028]

(1) Light hydrocarbon (the RON is 70): 100 parts by weight;
(2) Toluene: 30 parts by weight; and

(3) Surface active increased superscript agent: 0.1 parts by weight.

[0029] In example 3, the light hydrocarbon is a fraction extracted from condensate of a petrochemical plant or of the natural gas, with the main components being pentane and heavier hydrocarbons.

[0030] In example 3, the surface active increased superscript agent is as below:

③ $C_8F_{17}SO_2N(CH_3)CH_2CH_2OP(O)(OH)_2$

⑦ $C_{17}H_{35}CONH(CH_2)_2NHCOC_{17}H_{35}$

[0031] In example 3, the weight ratio of the surface active increased superscript agent ③ to the component ⑦ is 10:6.

[0032] The product is then obtained by mixing the components (1), (2) and (3), with the Research Octane Number (RON) being 93.

[0033] It should be explained that, what mentioned above is only the preferred embodiment of the present invention; any change that is made according to the concept of the present invention and its functional action produced is not yet out of the spirit of the specification, and should be within the scope of the present invention.

Claims

1. An environmental friendly vehicle light hydrocarbon fuel, **characterized in that** contents of its components are as below according to part by weight:

   (1) Light hydrocarbon: 100 parts by weight;
   (2) Aromatic hydrocarbon: 4~60 parts by weight;
   (3) Lead free antiknock: 0~20 parts by weight;
   (4) Cation fluorocarbon surfactant: 0 ~ 0.2 parts by weight; and
   (5) Surface active increased superscript agent: 0.001~2 parts by weight.

2. The environmental friendly vehicle light hydrocarbon fuel according to claim 1, **characterized in that** the light hydrocarbon is a fraction extracted from condensate of a petrochemical plant or of the natural gas, with the main components being pentane and heavier hydrocarbons.

3. The environmental friendly vehicle light hydrocarbon fuel according to claim 1, **characterized in that** the aromatic hydrocarbon includes toluene, xylene, or hybrid aromatic hydrocarbons for producing toluene.

4. The environmental friendly vehicle light hydrocarbon fuel according to claim 1, **characterized in that** the lead free antiknock includes methyl tert-butyl ether, tert-amyl methyl ether, tert-butyl alcohol, isobutanol, and anhydrous methanol or anhydrous ethanol.

5. The environmental friendly vehicle light hydrocarbon fuel according to claim 1, **characterized in that** the cation fluorocarbon surfactant, being fluorinated alkyl amine salt or quaternary ammonium salt type cation fluorocarbon surfactant, is selected from substances with a formula (1), (2) or (3) or mixture thereof:

   (1) Quaternary ammonium salt type cation fluorocarbon surfactant containing fluorinated alkyl amine:

   $(CF_3)_2CF(CF_2)_6CH_2CH(OH)CH_2N^+(CH_3)_3I^-$

   (2) Perfluorinated alkyl amide quaternary ammonium salt type cation fluorocarbon surfactant:

   $C_7F_{15}CONH(CH_2)_3N^+(CH_3)_3I^-$

   (3) Fluorinated alkyl amine salt type cation fluorocarbon surfactant:

   $[F(CF_2)_8CH(OH)CH_2]_2NCH_2CH_2NH_2 \cdot 1/2H_2SO_4$

6. The environmental friendly vehicle light hydrocarbon fuel according to claim 1, **characterized in that** the surface

active increased superscript agent is obtained by mixing one of components ① ~ ⑥ and a component ⑦:

① $C_8F_{17}SO_2N(CH_3)CH_2OP(O)(OH)_2$
② $C_8F_{17}SO_2N(CH_3)CH_2OP(O)(ONa)_2$
③ $C_8F_{17}SO_2N(CH_3)CH_2CH_2OP(O)(OH)_2$
④ $C_8F_{17}SO_2N(CH_3)CH_2CH_2OP(O)(ONa)_2$
⑤ $C_8F_{17}SO_2N(C_2H_5)CH_2CH_2OP(O)(OH)_2$
⑥ $C_8F_{17}SO_2N(C_2H_5)CH_2CH_2OP(O)(ONa)_2$
⑦ $C_{17}H_{35}CONH(CH_2)_2NHCOC_{17}H_{35}$

7. The environmental friendly vehicle light hydrocarbon fuel according to claim 6, **characterized in that** the surface active increased superscript agent is obtained by mixing 100 parts by weight one of the components ① ~ ⑥ and 60-80 parts by weight the component ⑦ according to claim 6.

8. The environmental friendly vehicle light hydrocarbon fuel according to claim 1, **characterized in that** the content of the cation fluorocarbon surfactant is preferably 0~0.1 parts by weight based on 100 parts by weight of the light hydrocarbon.

9. The environmental friendly vehicle light hydrocarbon fuel according to claim 1, **characterized in that** the content of the surface active increased superscript agent is preferably 0.01~0.2 parts by weight based on 100 parts by weight of the light hydrocarbon.

10. The environmental friendly vehicle light hydrocarbon fuel according to claim 1, **characterized in that** one of the following components or the mixture thereof may also be added if necessary:

⑧ $C_8F_{17}SO_2NHCH_2CH_3$
⑨ $C_8F_{17}SO_3K$
⑩ $C_8F_{17}SO_3N(C_2H_5)_4$

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2007/003170

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: C10L1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNKI, CPRS, WPI, EPODOC, PAJ: fluorocarbon, perfluo+, fluoro+, C#F##SO2+, sulfon+, sulpho+, CONH+, acidamide , acyl amide , amide

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	TW275638B (NEW MODERN CO LTD)11 Mar. 2007(11.03.2007) claim 12	1-10
A	EP1693433A1 (ZAKRYTOE AKTSIONERNOE OBSCHESTVO et al.) 23 Aug.2006 (23.08. 2006) whole document	1-10
A	JP62100592A (TAKEHARA KK) 11 May 1987 (11.05.1987) whole document	1-10
A	JP55152793A(SAMEJIMA TEIICHIRO) 28 Nov.1980(28.11.1980)whole document	1-10
A	GB1522012A(SHELL INT RESEARCH)23 Aug.1978(23.08.1978) whole document	1-10
A	CN1928031A (SHANGHAI CHINAMAX NEW ENERGY CO., LTD) 14 Mar.2007(14.03.2007)whole document	1-10

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
05 May 2008 (05.05.2008)	**19 Jun. 2008 (19.06.2008)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer LI Xiuzhen Telephone No. (86-10)62084732

Form PCT/ISA/210 (second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2007/003170

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
TW275638B	11.03.2007	NONE	
EP1693433A1	23.08. 2006	RU2246529 C1	20.02.2005
		WO2005049770 A1	02.06.2005
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CN1928031A	14.03.2007	NONE	

Form PCT/ISA/210 (patent family annex) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2007/003170

Continuation of: the second sheet, A. CLASSIFICATION OF SUBJECT MATTER

C10L1/20 (2006.01)i
C10L1/26(2006.01)i
C10L1/224 (2006.01)i
C10L1/04 (2006.01)n

Form PCT/ISA/210 (extra sheet) (April 2007)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- GB 1835232005 A **[0013] [0027]**