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(54) **FUEL COMPOSITION AND ITS USE**

KRAFTSTOFFZUSAMMENSETZUNG UND IHRE VERWENDUNG
COMPOSITION DE CARBURANT ET SON UTILISATION

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DescriptionField of the Invention

[0001] The present invention relates to a gasoline composition and its use, particularly, in combustion engines.

Background of the Invention

[0002] Spark initiated internal combustion gasoline engines require fuel of a minimum octane level which depends upon the design of the engine. Petroleum refineries are constantly faced with the challenge of continually improving their products to meet increasingly severe governmental efficiency and emission requirements, and consumers' desires for enhanced performance. For example, in producing a fuel suitable for use in an internal combustion engine, petroleum producers blend a plurality of hydrocarbon containing streams to produce a product that will meet governmental combustion emission regulations and the engine manufacturers performance fuel criteria, such as research octane number (RON). Similarly, engine manufacturers conventionally design spark ignition type internal combustion engines around the properties of the fuel. For example, engine manufacturers endeavor to inhibit to the maximum extent possible the phenomenon of auto-ignition which typically results in knocking and, potentially engine damage, when a fuel with insufficient knock-resistance is combusted in the engine.

[0003] Under typical driving situations, engines operate under a wide range of conditions depending on many factors including ambient conditions (air temperature, humidity, etc.), vehicle load, speed, rate of acceleration, and the like. Fuel blenders have to design products which perform well under such diverse conditions. This naturally requires compromise, as often times fuel properties or engine parameters that are desirable under certain speed/load conditions prove detrimental to overall performance at other speed/load conditions. It is desirable to provide high burn velocity fuel, particularly for use under lean conditions to shorten the burn duration and thereby improve the thermodynamic efficiency. A faster burn velocity also serves to maximize conversion of the fuel, thereby increasing the overall fuel economy and reducing emissions. Thus, the flame speed (related to burning velocity) of combustible fuel plays an important role in fuels chemistry and in the performance of engines (power) and emissions from spark-ignition engines.

[0004] US 7517215 B1 describes a method for distributed ignition wherein a combustion fuel and an ignition mixture are combined. The ignition mixture comprises ignition agents and fuel and where ignition agents can be nano-metallic particles in combination with single-walled carbon nano-tubes (SWCNTs).

[0005] US 5354344 A describes a fuel oil composition for use in a spark ignition engine, which comprises conventional gasoline for spark ignition engine use and a compound selected from the group consisting of an alkynyl alcohol, alkynyl ether, alkynyl ketone, alkenyl aldehyde or an acetal thereof, furan or a furan compound, and an alkenyl ether.

[0006] WO 2008/071628 A1 describes a method of increasing the sensitivity (RON - MON) of a gasoline composition comprising admixing with a gasoline base fuel from 1 to 20 vol.%, based on total volume of the gasoline composition, of a nitroalkane selected from the group consisting of nitroethane, nitropropane and mixtures thereof; and use of such a gasoline composition for improved operation of a homogeneous charge compression ignition (HCCI) engine over a range of load conditions.

Summary of the Invention

[0007] In accordance with a first aspect, the present invention provides a gasoline composition comprising (a) a major amount of a mixture of hydrocarbons in the gasoline boiling range and (b) a minor amount of cyclopropyl acetylene, wherein the term 'minor amount' means less than 50% by weight of the total fuel composition.

[0008] In another aspect, the present invention provides a method of (i) improving the flame speed of a gasoline and/or (ii) increasing sensitivity of a gasoline, which method comprises adding to a major portion of a gasoline mixture minor amounts of cyclopropyl acetylene, wherein the term 'minor amount' means less than 50% by weight of the total fuel composition.

Brief Description of the Drawing**[0009]**

Fig. 1 represents the Schlieren images of single combustion event 30ms after ignition of Base Fuel-1 plus 20% Cyclopropylacetylene.

Fig. 2 represents the Schlieren images of single combustion event 30ms after ignition of Base Fuel-1 only.

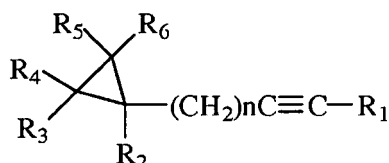
Fig. 3 represents improvement in Hyundai Acceleration Performance of the Faster Flame Speed fuel blends versus Base Fuel - 2 (reference fuel); all additive concentrations in ppmw.

Detailed Description of the Invention

[0010] We have found that the blended fuel composition described above significantly enhance the flame speed of gasoline fuels without compromise in RON. In an ideal case, flame speed is the measured rate of expansion of the flame front, generally measured in meters/second (m/s). In a spark engine, flame speed depends on gas pressure, temperature, and density change as a result of changes in volume due to piston motion (see Internal Combustion Engine Fundamentals, John B. Heywood. McGraw-Hill Book Co., 1988). Thus, "rate of expansion of the flame front" can also be measured by the increase in the pressure. Early pressure rise after spark (at 0 seconds) is also a measure of high burning velocity.

[0011] The gasoline composition of the present invention contains component (b) of a minor amount of cyclopropyl acetylene, wherein the term 'minor amount' means less than 50% by weight of the total fuel composition. Cyclopropyl acetylene includes an acetylenic group and the term "acetylenic group" refers to unsaturated hydrocarbons that have carbon atoms in chains linked by one or more triple bonds. The component (b) is a compound having the formula:

Formula I



wherein n is 0 and R₁ to R₆ are independently hydrogen. In an embodiment not claimed here, n could be an integer from 0 to 7; R₁ to R₆ could independently be hydrogen, alkyl group having 1 to 7 carbon atoms, alkenyl group having 1 to 7 carbon atoms, alkynyl group having 1 to 7 carbon atoms, cyclic group having 1 to 7 carbon atoms, with the proviso that the total number of carbon atoms in the compound are from 5 to 12.

[0012] Some of these cyclopropyl group-containing acetylenic compounds are available from GSF Chemicals Corporation and Sigma-Aldrich Company Ltd. Various synthetic routes can be used in the preparation of cyclopropyl group-containing acetylenic compounds. For example, cyclopropylacetylene can be prepared by chlorination of acetylcyclopropane with PCl₅ in the presence of an organic base in a chlorinated hydrocarbon with dehydrochlorination of the mixture of alpha, alpha dichlorocyclopropane and alpha-chlorovinylcyclopropane (with base at reflux in a solvent) and simultaneous distillation. (see Dolgii, I. E.; Shvedova, I. B.; Shavrin, K. N.; Nefedov, O. M. (Zelinskii, N. D., Institute of Organic Chemistry, USSR). U.S.S.R. (1977)) Dicyclopropylacetylenic derivatives can be prepared using Favorskii reaction and common organic synthesis procedure (Nefedov, O. M.; Dolgii, I. E.; Shvedova, I. B.; Baidzhigitova, E. A. Inst. Org. Khim. Im. Zelinskogo, Moscow, USSR. Izvestiya Akademii Nauk SSSR, Seriya Khimicheskaya (1978), (6), 1339-44.) Cyclopropyl Cyanide can be prepared by the reaction of sodium amide with chlorobutyronitrile (Organic Syntheses, Volume 3, page 223. John Wiley & Sons, Inc. Submitted by M. J. Schlatter and checked by R. L. Shriner and Chris Best). Other methods can be used to prepare the cyclopropyl group-containing acetylenic compounds useful in the invention as are known to one who is skilled in the art of organic synthesis. Examples of cyclopropyl group-containing acetylenic compounds include, for example, cyclopropyl acetylene; 1-cyclopropyl-1-propyne; 1-cyclopropyl-2-propyne; 1-methyl-1-ethynyl-cyclopropane; 2-methyl-1-ethynyl-cyclopropane; 1,1-(3-methylene-1-propyne-1,3-diyl)bis-; 1,1-bicyclopropyl, 2,2-diethynyl-; 1-cyclopropylpenta-1,3-diyne; cyclopropane, 1,1-(1,3-butadiyne-1,4-diyl)bis-; cyclopropane, 1,1-(3-methyl-1-propyne-1,3-diyl)bis-; and 1,4-dicyclopropylbuta-1,3-diyne.

[0013] The fuel composition of the present invention comprises a major amount of a mixture of hydrocarbons in the gasoline boiling range and a minor amount of component (b). As used herein for component (b), the term "minor amount" means less than 50% by weight of the total fuel composition, preferably less than about 30% by weight of the total fuel composition. However, the term "minor amount" will contain at least some amount, preferably at least 0.001% by weight of the total fuel composition.

[0014] An effective amount of component (b), more particularly cyclopropyl acetylene, is introduced into the combustion zone of the engine in a variety of ways to improve flame speed. As mentioned, a preferred method is to add a minor amount of component (b) to the fuel. For example, component (b) may be added directly to the fuel or blended with one or more carriers to form an additive concentrate which may then be added at a later date to the fuel.

[0015] The amount of component (b) used will depend on the particular variation of Formula I used, the engine, the fuel, and the presence or absence of carriers and additional detergents. Generally, component (b) is added in an amount up to about 20% by weight, especially from about 0.005% by weight, more preferably from about 0.05% by weight, even more preferably from about 0.5% by weight, most preferably from about 1% by weight, based on the total weight of the fuel composition.

[0016] Suitable liquid hydrocarbon fuels of the gasoline boiling range are mixtures of hydrocarbons having a boiling

range of from about 25°C to about 232°C and comprise mixtures of saturated hydrocarbons, olefinic hydrocarbons and aromatic hydrocarbons. Preferred are gasoline mixtures having a saturated hydrocarbon content ranging from about 40% to about 80% by volume, an olefinic hydrocarbon content from 0% to about 30% by volume and an aromatic hydrocarbon content from about 10% to about 60% by volume. The base fuel is derived from straight run gasoline, polymer gasoline, natural gasoline, dimer and trimerized olefins, synthetically produced aromatic hydrocarbon mixtures, or from catalytically cracked or thermally cracked petroleum stocks, and mixtures of these. The hydrocarbon composition and octane level of the base fuel are not critical. The octane level, (R+M)/2, will generally be above about 85. Any conventional motor fuel base can be employed in the practice of the present invention. For example, hydrocarbons in the gasoline can be replaced by up to a substantial amount of conventional alcohols or ethers, conventionally known for use in fuels. The base fuels are desirably substantially free of water since water could impede a smooth combustion.

[0017] The word major amount is used herein because the amount of hydrocarbons in the gasoline boiling range is often 50 weight or volume percent or more.

[0018] Normally, the hydrocarbon fuel mixtures to which the invention is applied are substantially lead-free, but may contain minor amounts of blending agents such as methanol, ethanol, ethyl tertiary butyl ether, methyl tertiary butyl ether, tert-amyl methyl ether and the like, at from about 0.1% by volume to about 15% by volume of the base fuel, although larger amounts may be utilized. The fuels can also contain conventional additives including antioxidants such as phenolics, e.g., 2,6-di-tertbutylphenol or phenylenediamines, e.g., N,N'-di-sec-butyl-p-phenylenediamine, dyes, metal deactivators, dehazers such as polyester-type ethoxylated alkylphenol-formaldehyde resins. Corrosion inhibitors, such as a polyhydric alcohol ester of a succinic acid derivative having on at least one of its alpha-carbon atoms an unsubstituted or substituted aliphatic hydrocarbon group having from 20 to 50 carbon atoms, for example, pentaerythritol diester of polyisobutylene-substituted succinic acid, the polyisobutylene group having an average molecular weight of about 950, in an amount from about 1 ppm (parts per million) by weight to about 1000 ppm by weight, may also be present.

[0019] The fuel compositions of the present invention may also contain one or more detergents. When detergents are utilized, the fuel composition will comprise a mixture of a major amount of hydrocarbons in the gasoline boiling range as described hereinbefore, a minor amount of component (b) as described hereinbefore and a minor amount of one or more detergents. As noted above, a carrier as described hereinbefore may also be included. As used herein for detergents, the term "minor amount" means less than about 10% by weight of the total fuel composition, preferably less than about 1% by weight of the total fuel composition and more preferably less than about 0.1% by weight of the total fuel composition. The one or more detergents are added directly to the hydrocarbons, blended with one or more carriers, blended with component (b), or blended with component (b) and one or more carriers before being added to the hydrocarbon. The compound of component (b) can be added at the refinery, at a terminal, at a depot, at a retail site, or by the consumer.

[0020] The treat rate of the fuel additive detergent packages that contains one or more detergents in the final fuel composition is generally in the range of from about 0.007 weight percent to about 0.76 weight percent based on the final fuel composition. The fuel additive detergent package may contain one or more detergents, dehazer, corrosion inhibitor and solvent. In addition a carrier fluidizer may sometimes be added to help in preventing intake valve sticking at low temperature.

[0021] While the invention is susceptible to various modifications and alternative forms, specific embodiments thereof are shown by way of examples herein described in detail. It should be understood, that the detailed description thereto are not intended to limit the invention to the particular form disclosed, but on the contrary, the intention is to cover all modifications, equivalents and alternatives falling within the scope of the appended claims. The present invention will be illustrated by the following illustrative embodiment, which is provided for illustration only and is not to be construed as limiting the claimed invention in any way.

Octane Test Methods

[0022] The Research Octane Number (RON) (ASTM D2699) and Motor Octane Number (MON) (ASTM D2700) will be the techniques used in determining the R+M/2 octane of the fuel. The RON and MON of a spark-ignition engine fuel is determined using a standard test engine and operating conditions to compare its knock characteristic with those of primary reference fuel blends of known octane number. Compression ratio and fuel-air ratio are adjusted to produce standard knock intensity for the sample fuel, as measured by a specific electronic detonation meter instrument system. A standard knock intensity guide table relates engine compression ratio to octane number level for this specific method. The specific procedure for the RON can be found in ASTM D-2699 and the MON can be found in ASTM D-2700.

[0023] Table I contains the engine conditions necessary to determine the RON and MON of a fuel.

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Table I

RON and MON Test Conditions		
Test Engine Conditions	Research Octane Number	Motor Octane Number
Test Method	ASTM D-2699-92	ASTM D-2700-92
Engine	Cooperative Fuels Research (CFR) Engine	Cooperative Fuels Research (CFR) Engine
Engine RPM	600 RPM	900 RPM
Intake Air	Varies with Barometric	38°C
Temperature	Pressure (eq 88kPa=19.4 °C, 101.6kPa = 52.2 °C)	
Intake Air Humidity	3.56 - 7.12 g H ₂ O/kg dry air	3.56 - 7.12 g H ₂ O/kg dry air
Intake mixture temperature	not specified	149 °C
Coolant Temperature	100 °C	100 °C
Oil Temperature	57 °C	57 °C
Ignition Advance-fixed	13 degrees BTDC	Varies with compression ratio (eq 14-26 degrees BTDC)
Carburetor Venture	Set according to engine altitude (eq 0 - 500 m = 14.3, 500 - 1000 m = 15.1 mm)	14.3 mm

Flame Speed Test Method

[0024] Flame Speed of the fuels were tested with Leeds Combustion Bomb Method as described in SAE Technical Paper Series 2000-01-0192, Aspects of Laminar and Turbulent Burning Velocity relevant to SI Engines, by L. Gillespie, M. Lawes, C.G.W. Sheppard and R. Woolley, SAE 2000 World Congress, Detroit, Michigan, March 6-9, 2000. Fuels were tested under laminar conditions with initial conditions of 5 bar absolute pressure and 360K. All the burning velocities were measured at an equivalence ratio $\phi = 1$ (i.e., stoichiometric). The tests were conducted using the Leeds Mk2 fan stirred combustion vessel (bomb) a stainless sphere of 30 liter volume and with extensive optical access. The fuels were injected into the bomb and allowed to vaporize fully, than a stoichiometric amount of air was added. The gases were mixed with stirring fans inside the vessel and the contents were heated to the desired temperature. The fans were turned off prior to ignition. Mixtures were ignited using a spark plug. Pressure transducers were flush mounted inside the bomb and recorded the pressure rise as a function of time.

Base Fuel

[0025] The base fuel physical properties used in the tests can be found in Table II.

Table II

Base Fuel Physical Properties				
Parameter	Method	Units	Base Fuel-1	Base Fuel-2
RON	ASTM D2699		95.4	95.3
MON	ASTM D2700		86.6	86.4
Density @ 15 °C	IP 365	g cm ⁻³	0.7300	0.7293
Oxidation Stability (induction)	IP 40	mins	> 1440	
Unwashed gum	IP 131	mg/100ml	6	8
Distillation	IP 123			

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(continued)

Base Fuel Physical Properties				
Parameter	Method	Units	Base Fuel-1	Base Fuel-2
IBP		°C	34.9	35.7
10% rec		°C	51.8	54.9
20% rec		°C	59.9	62.5
30% rec		°C	68.1	70.6
40% rec		°C	77.8	80.6
50% rec		°C	89.7	92.7
60% rec		°C	103.1	105.7
70% rec		°C	115.6	118.4
80% rec		°C	126.7	129.6
90% rec		°C	139.6	141.3
95% rec		°C	146.9	147.9
FBP		°C	167.1	171.4
Residue		% vol	1.0	1.0
Recovery		% vol	95.5	97.8
Loss		% vol	3.5	1.2
E70		% vol	32.0	29.1
E100		% vol	57.9	55.7
E120		% vol	74.0	71.4
E150		% vol	96.3	95.7
RVP	IP 394/ASTM 519	kPa	59.8	56.0
GC	LTP/26			
C			6.60	6.61
H			12.51	12.56
O			0.00	0.00
Paraffins		% vol	7.41	7.29
Isoparaffins		% vol	53.84	53.90
Olefins (including dienes)		% vol	3.06	3.76
Dienes		% vol	0.01	0.01
Napthenes	Napthenes % vol	% vol	6.28	6.14
Aromatics		% vol	29.07	28.79
Oxygenates		% vol	0.00	0.00
Unknowns		% vol	0.35	0.13
Total		% vol	100.01	100.01
Benzene (+Me Cyc5 ene)		% vol	0.48	0.52
Sulphur - WD XRF	ISO 20884	mg/kg		10
Sulphur - Antek	ISO 20846	mg/kg	5	

Examples 1-8

[0026] For examples 1-3, the additives were each added to Base Fuel 1 (Octane 91) at 20% in weight. These samples were then tested thrice for RON, MON, and flame speed. The average of three runs was tabulated in Table III. Similar blending method was used for examples 4-8 with Base Fuel 2 (Octane 91) at concentrations indicated in Table III.

Table III

Example #	Base blend	Additive (in weight %) in Gasoline	Flamespeed Pressure in bomb(bar) at 0.1s after ignition	RON	MON	(R+M) /2
1	Base Fuel 1	None	17.35	95.4	86.6	91.0
2	Base Fuel 1	20% of Cyclopropylacetylene	32.33	97.0	81.8	89.4
3	Base Fuel 1	20% of 1-Pentyne	26.59	93.2	81.8	87.5
4	Base Fuel 2	None	21.66	95.2	86.9	91.0
5	Base Fuel 2	5% of Cyclopropylacetylene	25.09	96.1	85.3	90.7
6	Base Fuel 2	10% of Cyclopropylacetylene	32.74	96.3	84.6	90.4
7	Base Fuel 2	5% of 1-Pentyne	24.22	95.3	85.6	90.4
8	Base Fuel 2	10% of 1-Pentyne	24.36	94.9	84.9	89.9

[0027] Addition of molecules containing cyclopropyl and acetylenic groups significantly enhanced the flame speed of the given fuel composition. The increase in cylinder pressure compared to the reference fuel after 0.1 seconds after ignition is used as the measure of the laminar flame speed. Results showed that Cyclopropylacetylene and 1-Pentyne at blend concentrations of 10% and 5% produced a statistically significant (at 99%) improvement in chamber pressure compared to the reference fuel. We chose another molecule with three member ring, without acetylene moiety (carbon triple bond carbon), for example, Carene. Carene was tested at 20% in Base Fuel 2. This blend showed no statistically significant improvement in pressure difference compared to the Base Fuel 2 (reference fuel).

[0028] At a concentration of 20 wt.% Cyclopropylacetylene in the Base Fuel-1 shows the pressure increase in the combustion chamber 0.1 seconds after ignition of the homogeneous charge is statistically (>95%) significantly greater than the Base Fuel-1 (reference fuel). For example, Schlieren images of the combustion, 30ms after the ignition event shown in the Figures clearly show a large difference in both the flame size and structure (Cyclopropylacetylene being more cellular). It is noted that at nearly 33ms the flame for the fuel blend containing cyclopropylacetylene fills the viewing window; the Base Fuel-1 (reference fuel) takes nearly 38.5ms to fill the viewing window, so it is not possible to show differences in flame size after this point. Hence the images are not shown at 100ms (0.1 seconds) after ignition to help corroborate the pressure data. However, pressure at 0.1 seconds has been tabulated in Table III.

[0029] Cyclopropylacetylene, 1-Pentyne were blended at 0.5% and 1.0% into Base Fuel - 2. Each fuel blend was tested in a single day along with the reference fuel (base fuel without the additive) in an A-B-A-B..... type test design on the chassis dynamometer. A Hyundai Coupe was used for the testing. As this vehicle has shown to be insensitive to changes in fuel octane the improvements in acceleration performance achieved between the test and reference fuel are attributed to changes in the laminar flame speed of the fuel. A standard chassis dynamometer power and acceleration test procedure on a Hyundai Coupe was used to obtain these results as shown in Figure 3. The figure shows over 0.2% acceleration performance improvements with 1% cyclopropylacetylene as an additive as compared to the base fuel without the additive.

[0030] The benefit of this increase in flame speed is best utilized in performance applications such as racing fuel and premium fuel. Addition of such molecules in fuels typically results in less pollution, more power and better efficiency. Faster burning fuels allow engines to run on lean mixtures of gasoline and air, potentially reducing nitrogen oxide and hydrocarbon emissions. As seen in the above Table, the flame speed of the cyclopropyl acetylene in gasoline is greatly

increased without lowering the RON value. Further, the fuel composition of the invention increases fuel sensitivity. There are industry reports that indicate fuel with higher sensitivity (lower MON) has better anti-knock quality. (see SAE Technical Paper Series 2001-01-3584, Fuel Anti-Knock quality-Part I. Engine Studies, by G.T. Kalghatgi and SAE Technical Paper Series 2001-01-3585, Fuel Anti-Knock Quality-Part II. Vehicle Studies -How Relevant is Motor Octane Number (MON) in Modern Engines, by G.T. Kalghatgi.) An increase in fuel sensitivity increases the "octane index" of the fuel which is a better measure of the anti-knock quality of the fuel, and leads to improved power and acceleration performance. As seen from the above Table III, while RON value of the cyclopropyl acetylene containing formulation is higher than the reference fuel without the cyclopropyl acetylene, MON value of the cyclopropyl acetylene containing formulation is lower than the reference fuel without the cyclopropyl acetylene.

Claims

1. A gasoline composition comprising (a) a major amount of a mixture of hydrocarbons in the gasoline boiling range and (b) a minor amount of cyclopropyl acetylene, wherein the term 'minor amount' means less than 50% by weight of the total fuel composition.
2. A fuel composition according to claim 1 wherein component (b) is present in an amount from 0.005% by weight to 20% by weight based on the total weight of the fuel.
3. A fuel composition according to claim 1 or claim 2 further comprising (c) a minor amount of a fuel detergent.
4. A method of (i) improving the flamespeed of a gasoline and/or (ii) increasing sensitivity of a gasoline, which method comprises adding to a major amount of a mixture of hydrocarbons in the gasoline boiling range minor amounts of cyclopropyl acetylene, wherein the term 'minor amount' means less than 50% by weight of the total fuel composition.
5. The use of a gasoline composition according to claim 1 to improve flamespeed of an internal combustion engine into which the gasoline composition is introduced.

Patentansprüche

1. Benzinzusammensetzung, umfassend (a) eine größere Menge eines Gemischs von Kohlenwasserstoffen im Benzinsiedebereich und (b) eine kleinere Menge Cyclopropylacetylen, wobei der Begriff "kleinere Menge" weniger als 50 Gew.-% der gesamten Kraftstoffzusammensetzung bedeutet.
2. Kraftstoffzusammensetzung nach Anspruch 1, wobei Komponente (b) in einer Menge von 0,005 Gew.-% bis 20 Gew.-%, bezogen auf das Gesamtgewicht des Kraftstoffs, vorliegt.
3. Kraftstoffzusammensetzung nach Anspruch 1 oder Anspruch 2, ferner umfassend (c) eine kleinere Menge eines Kraftstoff-Detergens.
4. Verfahren zur (i) Verbesserung der Flammengeschwindigkeit eines Benzins und/oder (ii) Verbesserung der Empfindlichkeit eines Benzins, bei dem man eine größere Menge eines Gemischs von Kohlenwasserstoffen im Benzinsiedebereich mit kleineren Mengen Cyclopropylacetylen versetzt, wobei der Begriff "kleinere Menge" weniger als 50 Gew.-% der gesamten Kraftstoffzusammensetzung bedeutet.
5. Verwendung einer Benzinzusammensetzung nach Anspruch 1 zur Verbesserung der Flammengeschwindigkeit eines Verbrennungsmotors, in den die Benzinzusammensetzung eingetragen wird.

Revendications

1. Composition d'essence comprenant (a) une grande quantité d'un mélange d'hydrocarbures dans l'intervalle de distillation de l'essence et (b) une petite quantité de cyclopropylacétylène, le terme « petite quantité » signifiant une quantité inférieure à 50 % en poids de la composition de carburant totale.
2. Composition de carburant selon la revendication 1, dans laquelle le composant (b) est présent dans une quantité

allant de 0,005 % en poids à 20 % en poids sur la base du poids total du carburant.

3. Composition de carburant selon la revendication 1 ou la revendication 2, comprenant en outre (c) une petite quantité d'un détergent de carburant.
4. Procédé pour (i) améliorer la vitesse de flamme d'une essence et/ou (ii) augmenter la sensibilité d'une essence, ledit procédé comprenant l'étape consistant à ajouter à une grande quantité d'un mélange d'hydrocarbures dans l'intervalle de distillation de l'essence de petites quantités de cyclopropylacétylène, le terme « petite quantité » signifiant une quantité inférieure à 50 % en poids de la composition de carburant totale.
5. Utilisation d'une composition d'essence selon la revendication 1 afin d'améliorer la vitesse de flamme d'un moteur à combustion interne dans lequel est introduite la composition d'essence.

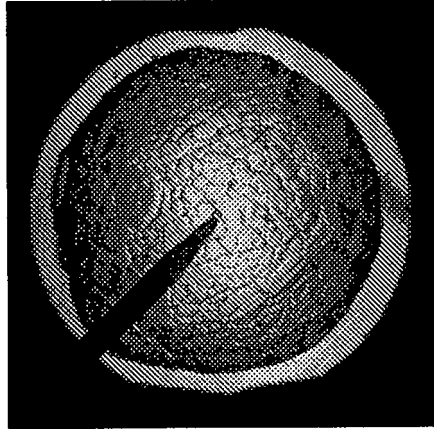


FIG. 1

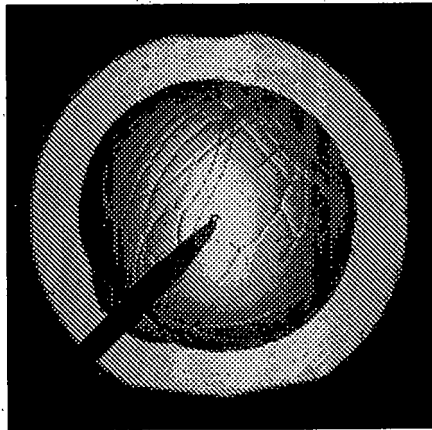


FIG. 2

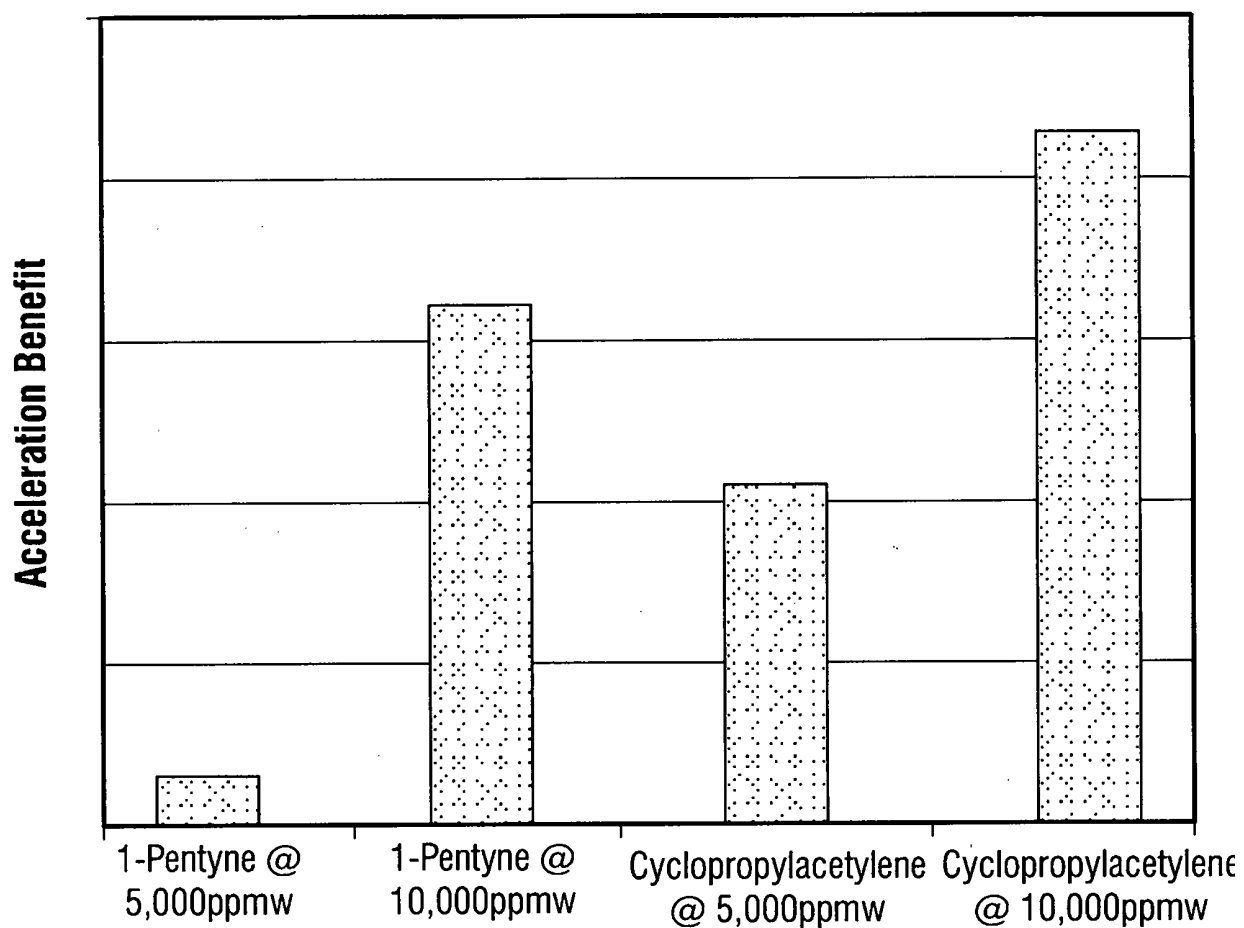


FIG. 3

REFERENCES CITED IN THE DESCRIPTION

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