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MOTOR FUELS

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7 Claims. (Cl. 44—69)

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This invention relates to a process for stabilising motor and aviation fuels containing anti-knock reagents.

The use of anti-knock reagents which contain tetra-ethyl lead is widely known and practised in the production of high quality fuels for use in internal combustion engines. In recent years there has been a growing demand for fuels showing still greater resistance to knock and this demand is particularly apparent in the case of aviation fuels. With a view to facilitate the production of these high quality fuels official specifications have appreciably relaxed the "lead tolerance," and the inclusion of much larger proportions of anti-knock reagents is now permitted in the manufacture of such fuels.

It is well known that gasoline containing tetra-ethyl lead, and particularly aviation gasolines which normally contain a higher proportion of the anti-knock reagent than motor gasolines, tend to become unstable on storage and to deposit a white precipitate containing lead. This instability tends to become more marked as the lead content of the fuel rises, and so the relaxation in lead tolerance allowed by the official specifications has accentuated the instability of these leaded fuels.

The reason for this instability has been investigated to some extent and we have found that, among other things, certain sulphur compounds have a marked effect in producing instability. There is some evidence that certain olefines also promote instability. The sulphur containing bodies so far found to exhibit this property are elemental sulphur, hydrogen sulphide, carbon disulphide and thiophene. So far as we have ascertained alkyl sulphides and mercaptans do not appear to have any appreciable effect on the stability of a leaded fuel.

We have found that leaded fuels may be stabilised by the addition thereto of minor proportions of alkyl sulphates.

According to the invention therefore fuels for internal combustion engines which contain tetra-ethyl lead as the main anti-knock additive, are stabilised against deterioration in storage by the addition thereto of a small proportion of an alkyl sulphate.

The proportion of stabilising agent to be added will usually be appreciably less than 1% and, as may be observed from the results given below, satisfactory results are achieved where the fuel contains as little as 0.001% of the additive.

The alkyl sulphates may be incorporated in the fuel in a number of ways depending on circumstances. They may, for example, be added to finished fuel, or to any of the constituents of the fuel prior to blending, or to the anti-knock reagent, or incorporated during the blending process, or during the "leading" operation. Satisfactory results may be attained in any of these ways but it may generally be found most convenient to carry out the addition during the "leading" operation since this is most likely to ensure an intimate mixing of fuel, anti-knock reagent and additive.

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The following examples illustrate the advantages which result from the stabilisation of leaded fuels according to the invention. In each of the examples the fuel used contained 5.5 ml. TEL./I. G. and the storage tests were carried out at 120° F. Criteria of instability under the conditions of test were the times taken in days for the appearance of (*a*) barely visible (trace) (*b*) clearly visible (medium) and (*c*) heavy precipitates. The time taken to form a medium or heavy precipitate is a measure of the stability to be expected in practice. The formation of a trace precipitate is not considered to be of importance.

Example I.—A C_4 aviation alkylate containing lead on storage in the dark, was found to deposit a trace of precipitate after one day and a medium precipitate after 15 days.

The same fuel with the addition of 0.001% by volume of di-ethyl sulphate deposited a trace of precipitate after 68 days and a medium precipitate after 86 days.

Example II.—The fuel used in this example was a sulphur free iso-octane to which thiophene had been added in quantity sufficient to give the fuel a sulphur content of 0.006% by weight.

Fuel	No. of days for deposition of precipitate		
	Trace	Medium	Heavy
Uninhibited fuel	2	5	7
Fuel+0.01% Diethyl Sulphate	1	4	13
Fuel+0.001% Diethyl Sulphate	1	18	21

Example III.—Using the same materials as in Example II, but using only sufficient thiophene to give the fuel a sulphur content of 0.0025% by weight, the periods for the formation of a trace and a medium deposition of precipitate were 1 day and 7 days respectively, in the case of the uninhibited fuel, and 7 days and more than 35 days when 0.001% of diethyl sulphate had been added to the fuel.

Example IV.—The leaded fuel in this example

consisted of 90% of sulphur free iso-octane+10% of a C_5 fraction from C_4 aviation alkylate.

Fuel	No. of days for deposition of precipitate		
	Trace	Medium	Heavy
Uninhibited fuel	6	13	14
Fuel +0.01% diethyl sulphate	2	18	27

Example V.—The following table indicates results of tests made upon stable alkylates and unstable aviation fuel respectively containing sulphur as thiophene, CS_2 and 0.002%S, and the periods taken in days for the trace or medium or heavy precipitate to form.

Sample	Inhibitor	Concentration	Days to form precipitate of—		
			Trace	Medium	Heavy
		Per cent vol.			
Stable alkylate+0.005% sulphur as thiophene	none			1	7
Do	Dimethyl Sulphate	0.001		1	31
Do	Dipropyl Sulphate	0.001	4	7	30
Do	Dibutyl Sulphate	0.001	4	19	30
Stable alkylate+0.005% sulphur as CS_2	none				1
Do	Dimethyl Sulphate	0.001			8
Do	Diethyl Sulphate	0.001		1	3
Do	Dipropyl Sulphate	0.001	1	5	10
Do	Dibutyl Sulphate	0.001	3		4
Unstable aviation fuel (0.002%S)	none				1
Do	Diethyl Sulphate	0.001		1	2
Do	Dipropyl Sulphate		1	3	5
Do	Dibutyl Sulphate		1	3	5

We claim:

1. A process for stabilising gasoline fuels containing tetra-ethyl lead, consisting in the addition to the fuel of a small proportion of dialkyl sulphate.

2. A process for stabilising gasoline fuels containing tetra-ethyl lead, consisting in the addition to the fuel of appreciably less than 1% of dialkyl sulphate.

3. A process for stabilising gasoline fuels containing tetra-ethyl lead, consisting in the addition to the fuel of at least 0.001% by volume of diethyl sulphate.

4. A product of manufacture being a gasoline fuel containing tetra-ethyl lead and dialkyl sulphate stabilising reagent in a proportion within the range 0.001% to 1%.

5. A product of manufacture being a gasoline fuel containing tetra-ethyl lead and diethyl sulphate stabilising reagent in a proportion within the range 0.001% to 1%.

6. A process for stabilising a blended gasoline fuel containing tetra-ethyl lead, consisting in the addition of a small proportion of dialkyl sulphate to the blended fuel.

7. A process for producing a stabilised blended gasoline fuel containing tetra-ethyl lead, consisting in the addition of a small proportion of dialkyl sulphate during the blending of the fuel.

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