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(11) **EP 0 884 377 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
17.03.2004 Bulletin 2004/12

(51) Int Cl.7: **C10L 3/12, C10L 3/00**

(21) Application number: **98201892.1**

(22) Date of filing: **08.06.1998**

(54) **Liquefied petroleum gas composition**

Flüssigpetroleumgaszusammensetzung

Composition de gaz de pétrole liquéfié

(84) Designated Contracting States:
BE DE ES FR GB IT LU NL

(30) Priority: **09.06.1997 EP 97303961**

(43) Date of publication of application:
16.12.1998 Bulletin 1998/51

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90-196131 XP002099312 & JP 02 127496 A
(SHIN-KO KAGAKU KOGY) , 16 May 1990**

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Description

[0001] The present invention relates to liquefied petroleum gas which is a mixture of propane and butanes that can be liquefied under relatively low pressure and at ambient temperature. Such liquefied petroleum gas is for example used as lighter fuel and as aerosol propellant.

[0002] The present invention relates in particular to deterring ingestion of liquefied petroleum gas by denaturing the liquefied petroleum gas.

[0003] It is an object of the present invention to provide a liquefied petroleum gas composition which includes a denaturant composition which is soluble in liquefied petroleum gas.

[0004] To this end the liquefied petroleum gas composition according to the present invention comprises liquefied petroleum gas and a denaturant composition comprising denatonium benzoate dissolved in a low molecular weight alcohol.

[0005] Denatonium benzoate, the most bitter substance known to man, is a well known denaturant which is commercially available from McFarlan Smith Limited under the name Bitrex and is used in alcohol fuel (JP-02-127 496).

[0006] The present invention is based on the finding that the denatonium benzoate is insoluble in liquefied petroleum gas because it is a polar substance. Applicant had found, however, that a composition comprising denatonium benzoate dissolved in a low molecular weight alcohol is soluble in liquefied petroleum gas.

[0007] In the specification and in the claims, the term 'low molecular weight alcohol' is used to refer to an alcohol having an alkyl group with between 1 and 5 carbon atoms, and suitably between 1 and 3 carbon atoms. Suitable low molecular weight alcohols are methanol and isopropyl alcohol.

[0008] In order to obtain a stable solution of the denaturant composition in the liquefied petroleum gas, the concentration of denatonium benzoate in the low molecular weight alcohol should not exceed 1 %m, and suitably the concentration is between 0.5 and 1 %m.

[0009] Applicant had found that the denaturant composition is sufficiently active at low concentrations, therefore the concentration of the denaturant composition in the liquefied petroleum gas composition suitably is not more than 1 000 ppm, and more suitably between 500 and 1 000 ppm. Suitably in the liquefied petroleum gas composition the concentration of denatonium benzoate in the low molecular weight alcohol is between 0.5 and 1 %m and the concentration of the denaturant composition is not more than 1 000 ppm.

[0010] The concentration of denatonium benzoate in the low molecular alcohol is expressed in %m, for example 1 %m corresponds to 1 g denatonium benzoate in 100 g alcohol. The concentration of denaturant composition in the liquefied petroleum gas composition is expressed in ppm (parts per million based on mass), for example 1 000 ppm of denaturant composition corresponds to 1 g of denaturant composition per kg of liquefied petroleum gas.

[0011] The invention will now be described by way of example in more detail with reference to the below example.

[0012] Several experiments had been carried out to establish the concentration of denatonium benzoate in the denaturant composition and the concentration of the denaturant composition in the liquefied petroleum gas composition which would ensure a solution that is stable during normal operating conditions.

[0013] Here normal operating conditions are storage of the liquefied petroleum gas in steel cylinders at temperatures between -5 to +20 °C, and a solution is considered to be stable when after being stored for six months the final amount of denatonium benzoate is 90 %m or more of the initial amount of denatonium benzoate in the liquefied petroleum gas.

[0014] The below Table summarises the results of the experiments.

[0015] Table. Summary of the compositions used in the experiments and the results, DB refers to denatonium benzoate, MeOH refers to methanol, DC refers to denaturant composition and LPG refers to liquefied petroleum gas, and [X] means concentration of X.

| | Composition A | Composition B |
|--------------|-----------------|-------------------|
| [DB] in MeOH | 1% _m | 2 % _m |
| [DC] in LPG | 1 000 ppm | 500 ppm |
| [DB] in LPG | 10 ppm | 10 ppm |
| Result | stable solution | unstable solution |

[0016] Furthermore composition A remained stable for 48 hours under more stringent temperature conditions between -20 and +40 °C.

[0017] From the above experiments, it can be concluded that . the denaturant composition of the present invention is soluble in liquefied petroleum gas, and that a stable solution can be prepared if the denaturant composition contains between 0.5 and 1 %_m of denatonium benzoate.

Claims

- 5
1. A liquefied petroleum gas composition comprising liquefied petroleum gas and a denaturant composition comprising denatonium benzoate dissolved in an alcohol having an alkyl group between 1 and 5 carbon atoms.
 2. Liquefied petroleum gas composition as claimed in claim 1, wherein the alcohol is methanol or isopropyl alcohol.
 3. Liquefied petroleum gas composition as claimed in claim 1 or 2, wherein the concentration of denatonium benzoate in the alcohol is between 0.5 and 1 %m.
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 4. Liquefied petroleum gas composition according to any one of the claims 1-3, wherein the concentration of the denaturant composition is not more than 1 000 ppm.
 5. Liquefied petroleum gas composition as claimed in claim 1 or 2, wherein the concentration of denatonium benzoate in the alcohol is between 0.5 and 1 %m, and wherein the concentration of the denaturant composition is not more than 1 000 ppm.
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Patentansprüche

- 20
1. Flüssiggaszusammensetzung, umfassend Flüssiggas und eine Vergällungsmittelzusammensetzung, die Denatoniumbenzoat, aufgelöst in einem Alkohol mit einer Alkylgruppe mit 1 bis 5 Kohlenstoffatomen, umfaßt.
 2. Flüssiggaszusammensetzung nach Anspruch 1, worin der Alkohol Methanol oder Isopropylalkohol ist.
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 3. Flüssiggaszusammensetzung nach Anspruch 1 oder 2, worin die Konzentration an Denatoniumbenzoat in dem Alkohol zwischen 0,5 und 1 Masse-% beträgt.
 4. Flüssiggaszusammensetzung nach einem der Ansprüche 1 bis 3, worin die Konzentration der Vergällungsmittelzusammensetzung nicht über 1.000 Masseteile pro Million beträgt.
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 5. Flüssiggaszusammensetzung nach Anspruch 1 oder 2, worin die Konzentration an Denatoniumbenzoat in dem Alkohol zwischen 0,5 und 1 Masse-% beträgt und worin die Konzentration der Vergällungsmittelzusammensetzung nicht über 1.000 Masseteilen pro Million liegt.
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Revendications

- 40
1. Composition de gaz de pétrole liquéfié comprenant du gaz de pétrole liquéfié et une composition dénaturante comprenant du benzoate de dénatonium dissous dans un alcool comportant un groupe alkyle entre 1 et 5 atomes de carbone.
 2. Composition de gaz de pétrole liquéfié suivant la revendication 1, dans laquelle l'alcool est du méthanol ou de l'alcool isopropylique.
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 3. Composition de gaz de pétrole liquéfié suivant l'une ou l'autre des revendications 1 et 2, dans laquelle la concentration de benzoate de dénatonium dans l'alcool se situe entre 0,5 et 1 %m.
 4. Composition de gaz de pétrole liquéfié suivant l'une quelconque des revendications 1 à 3, dans laquelle la concentration de la composition dénaturante n'est pas supérieure à 1.000 ppm.
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 5. Composition de gaz de pétrole liquéfié suivant l'une ou l'autre des revendications 1 et 2, dans laquelle la concentration de benzoate de dénatonium dans l'alcool se situe entre 0,5 et 1 %m, et dans laquelle la concentration de la composition dénaturante n'est pas supérieure à 1.000 ppm.
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