CLAIMS

1. Use of a guanidinium-based ionic liquid as detergent in a lubricant composition for lubricating marine engines

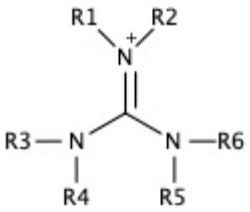
wherein the guanidinium-based ionic liquid responds to formula (I):

$[CAT^+]\ [X^-]$

(I)

wherein

$[X^-]$ represents one or more anionic species; $[CAT^+]$ is selected from cations of formula (II):



(II)

wherein:

R1, R2 are each independently selected from H, a C1-C30 linear or branched alkyl group, a C3-C8 cycloalkyl group, a C6-C12 aryl group, or a C7-C12 aralkyl group, optionally substituted by a functional group comprising an oxygen and/or a nitrogen atom,

R3, R4, R5, R6 are each independently selected from a C1-C30 linear or branched alkyl group, a C3-C8 cycloalkyl group, a C6-C12 aryl group, or a C7-C12 aralkyl group, optionally substituted by a functional group comprising an oxygen and/or a nitrogen atom,

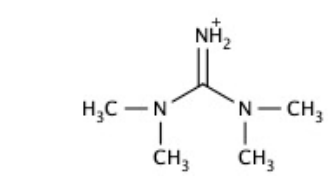
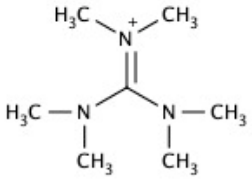
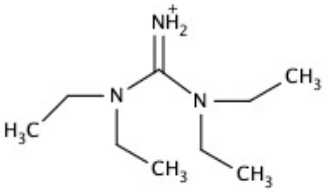
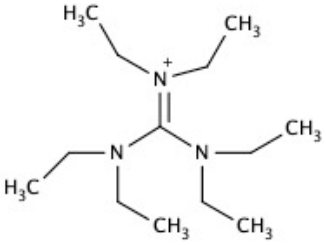
Or any two of (R3, R4) or (R5, R6) form together a methylene chain $–(CH_2)p-$, with p is an integer from 2 to 5.

2. The use according to claim 1, wherein in formula (II):

R1, R2 are each independently selected from H, a C1-C6 linear or branched alkyl group,

R3, R4, R5, R6 are each independently selected from a C1-C6 linear or branched alkyl group.

3. The use according to claim 2, wherein [CAT^+] is selected from:

4. The use according to any one of claim 1 to 3, wherein [X^-] is selected from:

a) carboxylates Ra-COO^-, wherein Ra is selected from alkyl and alkenyl groups comprising from 1 to 30 atoms of carbon, aryl groups comprising from 6 to 30 atoms of carbon, aralkyl groups comprising from 7 to 30 atoms of carbon, optionally substituted by a functional group comprising an oxygen and/or a nitrogen atom;

b) alcoholates RaRbHCO^-, wherein Ra is selected from alkyl and alkenyl groups comprising from 1 to 30 atoms of carbon, aryl groups comprising from 6 to 30 atoms of carbon, aralkyl groups comprising from 7 to 30 atoms of carbon, Rb is selected from H, alkyl and alkenyl groups comprising from 1 to 30 atoms of carbon, aryl groups comprising from 6 to 30 atoms of carbon, aralkyl groups comprising from 7 to 30 atoms of carbon, optionally substituted by a functional group comprising an oxygen and/or a nitrogen atom;

c) hydroxycarboxylates HO-Rc-COO^-, wherein Rc is a di-radical selected from alkyl and alkenyl groups comprising from 1 to 30 atoms of carbon, aryl groups comprising from 6 to 30 atoms of carbon, aralkyl groups comprising from 7 to 30 atoms of carbon, optionally substituted by a functional group comprising an oxygen and/or a nitrogen atom.

5. The use according to claim 4, wherein [X^-] is selected from: 2-ethylhexanoate, 2-hydroxypropanoate, tert-amylphenolate, isooctylphenolate or dioctylamino phenolate.

6. A lubricant composition comprising:

- from 30.0 to 94 % of at least one base oil,
- from 0.05 to 15.0 % of at least one guanidinium-based ionic liquid,
- from 1 to 35% by weight of at least one detergent (Det) selected from neutral and overbased detergents having a Total Base Number according to ASTM D2896 of from 20 to 450 mg KOH/g

the percentages being defined by weight of component as compared to the total weight of the composition,

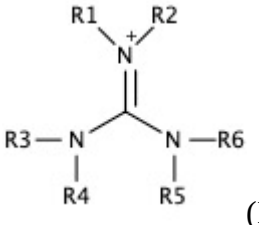
wherein the guanidinium-based ionic liquid responds to formula (I):

[CAT^+] [X^-]

(I)

wherein

[X^-] represents one or more anionic species, [CAT^+] is selected from cations of formula (II):



(II)

wherein:

R1, R2 are each independently selected from H, a C1-C30 linear or branched alkyl group, a C3-C8 cycloalkyl group, a C6-C12 aryl group, or a C7-C12 aralkyl group, optionally substituted by a functional group comprising an oxygen and/or a nitrogen atom,

R3, R4, R5, R6, are each independently selected from a C1-C30 linear or branched alkyl group, a C3-C8 cycloalkyl group, a C6-C12 aryl group, or a C7-C12 aralkyl group, optionally substituted by a functional group comprising an oxygen and/or a nitrogen atom,

Or any two of (R3, R4) or (R5, R6) form together a methylene chain $–(CH_2)p-$, with p is an integer from 2 to 5.

7. The lubricant composition according to claim 6, wherein the percentage by weight of guanidinium-based ionic liquid relative to the total weight of lubricant composition is chosen such that the alternative BN provided by the oil-soluble guanidinium-based ionic liquid represents at least 3% of the BN of said lubricant composition.

8. The lubricant composition according to claim 6 or claim 7, which has a Total Base Number (TBN) value according to ASTM D2896 of above 5 mg KOH/g.

9. The lubricant composition according to any one of claim 6 to claim 8, which has a kinematic viscosity at 100°C superior or equal to 5.6 mm^2/s and inferior or equal to 21.9 mm^2/s.

10. The lubricant composition according to claim 6, wherein $[X^-]$ is selected from:

a) carboxylates $Ra\text{-}COO^-$, wherein Ra is selected from alkyl and alkenyl groups comprising from 1 to 30 atoms of carbon, aryl groups comprising from 6 to 30 atoms of carbon, aralkyl groups comprising from 7 to 30 atoms of carbon, optionally substituted by a functional group comprising an oxygen and/or a nitrogen atom;

b) alcoholates $RaRbHCO^-$, wherein Ra is selected from alkyl and alkenyl groups comprising from 1 to 30 atoms of carbon, aryl groups comprising from 6 to 30 atoms of carbon, aralkyl groups comprising from 7 to 30 atoms of carbon, Rb is selected from H, alkyl and alkenyl groups comprising from 1 to 30 atoms of carbon, aryl groups comprising from 6 to 30 atoms of carbon, aralkyl groups comprising from 7 to 30 atoms of carbon, optionally substituted by a functional group comprising an oxygen and/or a nitrogen atom;

c) hydroxycarboxylates $HO\text{-}Rc\text{-}COO^-$, wherein Rc is a di-radical selected from alkyl and alkenyl groups comprising from 1 to 30 atoms of carbon, aryl groups comprising from 6 to 30 atoms of carbon, aralkyl groups comprising from 7 to 30 atoms

of carbon, optionally substituted by a functional group comprising an oxygen and/or a nitrogen atom.

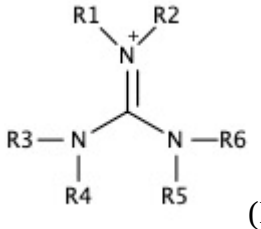
11. Method for lubricating two-stroke marine engines and four-stroke marine engines, said method comprising application to said marine engine of the lubricant composition defined in any one of claims 6 to 10.

12. Method for reducing and/or limiting and/or preventing and/or delaying the formation of deposits or for reducing the deposits already present in the internal parts of a marine engine, comprising applying a guanidinium-based ionic liquid to the internal parts of the marine engine, wherein the guanidinium-based ionic liquid has the formula (I)

$[CAT^+]\ [X^-]$ (I)

wherein

$[X^-]$ represents one or more anionic species; $[CAT^+]$ is selected from cations of formula (II):



(II)

wherein:

R1, R2 are each independently selected from H, a C1-C30 linear or branched alkyl group, a C3-C8 cycloalkyl group, a C6-C12 aryl group, or a C7-C12 aralkyl group, optionally substituted by a functional group comprising an oxygen and/or a nitrogen atom,

R3, R4, R5, R6 are each independently selected from a C1-C30 linear or branched alkyl group, a C3-C8 cycloalkyl group, a C6-C12 aryl group, or a C7-C12 aralkyl group, optionally substituted by a functional group comprising an oxygen and/or a nitrogen atom,

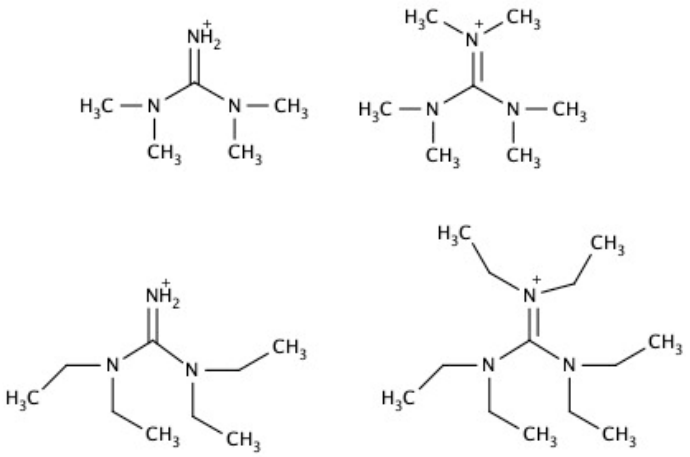
Or any two of (R3, R4) or (R5, R6) form together a methylene chain $–(CH_2)p-$, with p is an integer from 2 to 5.

13. The method according to claim 12, wherein in formula (II):

R1, R2 are each independently selected from H, a C1-C6 linear or branched alkyl group, and

R3, R4, R5, R6 are each independently selected from a C1-C6 linear or branched alkyl group.

14. The method according to claim 12 or claim 13, wherein [CAT^+] is selected from:



15. The method according to claim 12, wherein [X^-] is selected from:

a) carboxylates Ra-COO^-, wherein Ra is selected from alkyl and alkenyl groups comprising from 1 to 30 atoms of carbon, aryl groups comprising from 6 to 30 atoms of carbon, aralkyl groups comprising from 7 to 30 atoms of carbon, optionally substituted by a functional group comprising an oxygen and/or a nitrogen atom;

b) alcoholates RaRbHCO^-, wherein Ra is selected from alkyl and alkenyl groups comprising from 1 to 30 atoms of carbon, aryl groups comprising from 6 to 30 atoms of carbon, aralkyl groups comprising from 7 to 30 atoms of carbon, Rb is selected from H, alkyl and alkenyl groups comprising from 1 to 30 atoms of carbon, aryl groups comprising from 6 to 30 atoms of carbon, aralkyl groups comprising from 7 to 30 atoms of carbon, optionally substituted by a functional group comprising an oxygen and/or a nitrogen atom;

c) hydroxycarboxylates HO-Rc-COO^-, wherein Rc is a di-radical selected from alkyl and alkenyl groups comprising from 1 to 30 atoms of carbon, aryl groups

comprising from 6 to 30 atoms of carbon, aralkyl groups comprising from 7 to 30 atoms of carbon, optionally substituted by a functional group comprising an oxygen and/or a nitrogen atom.

16. The method according to claim 15, wherein [X^-] is selected from: 2-ethylhexanoate, 2-hydroxypropanoate, tert-amylphenolate, isooctylphenolate or dioctylamino phenolate.