CLAIMS

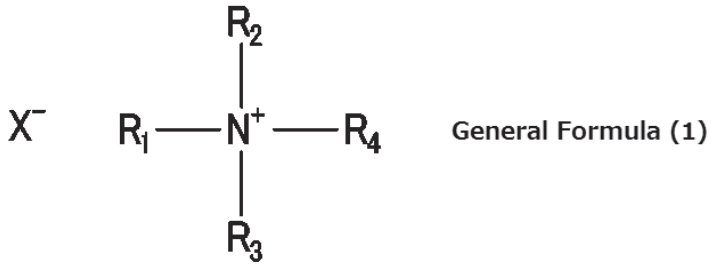
1. A lubricating agent, comprising:

an ionic liquid formed from a Bronsted acid (HX) and a Bronsted base (B),

wherein the ionic liquid is represented by the following General Formula (1), (2) or (3),

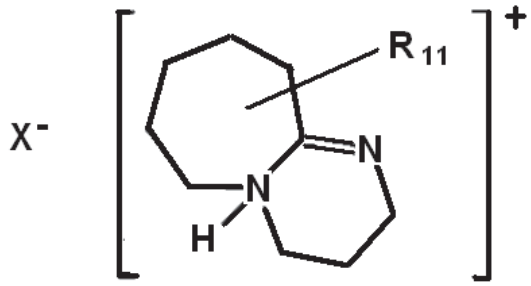
wherein the Bronsted acid is perfluoroalkyl sulfonic acid, a compound represented by the following Structural Formula (A), a compound represented by the following Structural Formula (B), a compound represented by the following Structural Formula (C), or a compound represented by the following Structural Formula (D), and

wherein a difference between a pKa value of the Bronsted acid in water and a pKa value of the Bronsted base in water is 12 or more:



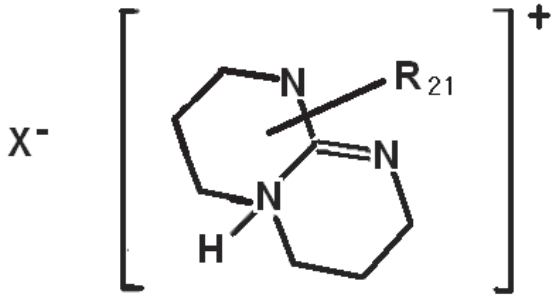
General Formula (1)

wherein at least one of R_1, R_2, R_3, and R_4 is a hydrogen atom, and at least one of R_1, R_2, R_3, and R_4 is a group which contains the linear hydrocarbon group having 10 or more carbon atoms,



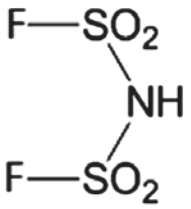
General Formula (2)

wherein R_{11} denotes the linear hydrocarbon group having 10 or more carbon atoms and being attached to a carbon atom in a bicyclo ring,

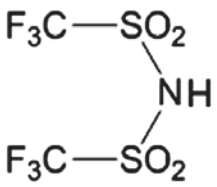


General Formula (3)

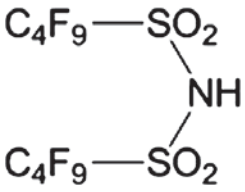
wherein R_{21} denotes the linear hydrocarbon group having 10 or more carbon atoms and being attached to a carbon atom or a nitrogen atom in a bicyclo ring.



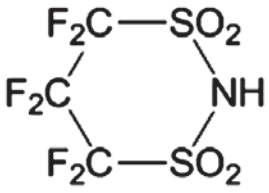
Structural Formula (A)



Structural Formula (B)



Structural Formula (C)

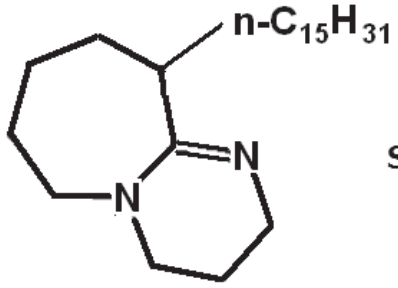


Structural Formula (D)

2. The lubricating agent according to claim 1, wherein the ionic liquid has an exothermic peak temperature determined by a differential thermal analysis (DTA) measurement of 370°C or higher.

3. The lubricating agent according to any one of claims 1 to 2, wherein the hydrocarbon group is an alkyl group.

4. The lubricating agent according to any one of claims 1 to 3, wherein the Bronsted base is octadecylamine ($C_{18}H_{37}NH_2$), decylamine ($C_{10}H_{21}NH_2$), tetradecylamine ($C_{14}H_{29}NH_2$), eicosylamine ($C_{20}H_{41}NH_2$), oleylamine ($C_{18}H_{35}NH_2$), 2-heptylundecylamine ($CH_3(CH_2)_9CH(C_7H_{15})NH_2$), or a compound represented by the following Structural Formula (1):



Structural Formula (1)

5. A lubricating agent, comprising:

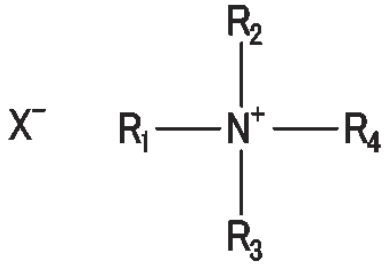
an ionic liquid formed from a Bronsted acid (HX) and a Bronsted base (B),

wherein the ionic liquid is represented by the following General Formula (1), (2) or (3),

wherein the Bronsted acid is perfluoroalkyl sulfonic acid, a compound represented by the following Structural Formula (A), a compound represented by the following Structural Formula (B), a compound represented by the following Structural Formula (C), or a compound

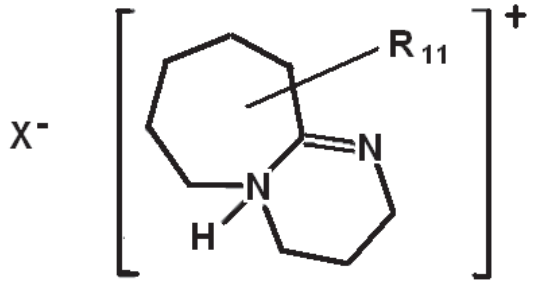
represented by the following Structural Formula (D), and

wherein a difference between a pKa value of the Bronsted acid in acetonitrile and a pKa value of the Bronsted base in acetonitrile is 17 or more:



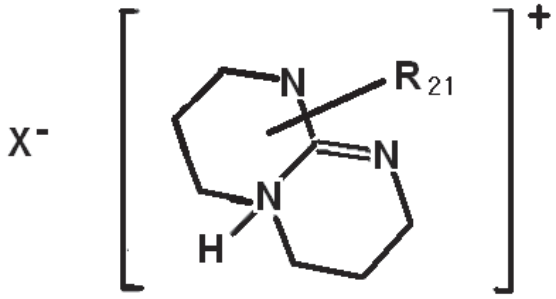
General Formula (1)

wherein at least one of R_1, R_2, R_3, and R_4 is a hydrogen atom, and at least one of R_1, R_2, R_3, and R_4 is a group which contains the linear hydrocarbon group having 10 or more carbon atoms,



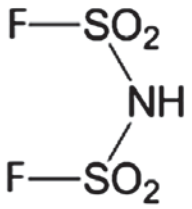
General Formula (2)

wherein R_{11} denotes the linear hydrocarbon group having 10 or more carbon atoms and being attached to a carbon atom in a bicyclo ring,

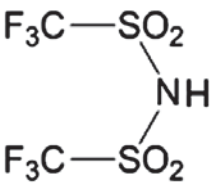


General Formula (3)

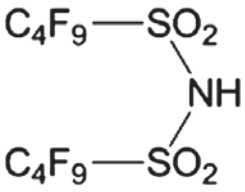
wherein R_{21} denotes the linear hydrocarbon group having 10 or more carbon atoms and being attached to a carbon atom or a nitrogen atom in a bicyclo ring.



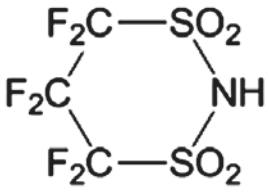
Structural Formula (A)



Structural Formula (B)



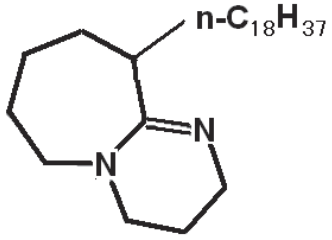
Structural Formula (C)



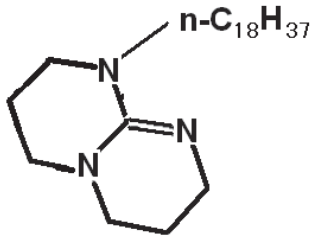
Structural Formula (D)

6. The lubricating agent according to claim 5, wherein the ionic liquid has an exothermic peak temperature determined by a differential thermal analysis (DTA) measurement of 370°C or higher.

7. The lubricating agent according to any one of claims 5 to 6, wherein the Bronsted base is octadecylamine ($C_{18}H_{37}NH_2$), decylamine ($C_{10}H_{21}NH_2$), tetradecylamine ($C_{14}H_{29}NH_2$), eicosylamine ($C_{20}H_{41}NH_2$), oleylamine ($C_{18}H_{35}NH_2$), 2-heptylundecylamine ($CH_3(CH_2)_9CH(C_7H_{15})NH_2$), a compound represented by the following Structural Formula (2), or a compound represented by the following Structural Formula (3):



Structural Formula (2)



Structural Formula (3)

8. A magnetic recording medium, comprising:

a non-magnetic support; and

at least a magnetic layer on or above the non-magnetic support,

wherein the magnetic layer contains the lubricating agent according to any one of claims 1 to 7.

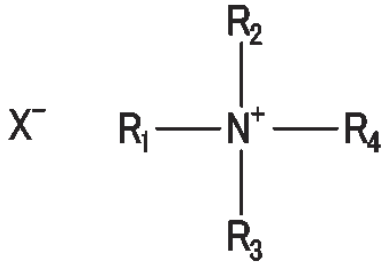
9. An ionic liquid,

wherein the ionic liquid is formed from a Bronsted acid (HX) and a Bronsted base (B),

wherein the ionic liquid is represented by the following General Formula (1), (2) or (3),

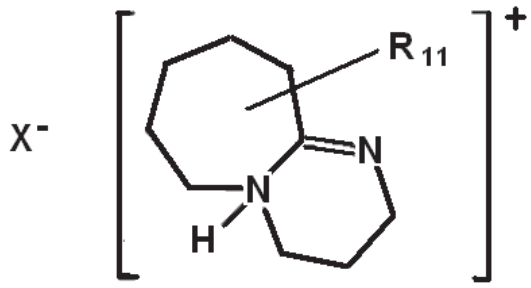
wherein the Bronsted acid is perfluoroalkyl sulfonic acid, a compound represented by the following Structural Formula (A), a compound represented by the following Structural Formula (B), a compound represented by the following Structural Formula (C), or a compound represented by the following Structural Formula (D), and

wherein a difference between a pKa value of the Bronsted acid in water and a pKa value of the Bronsted base in water is 12 or more:



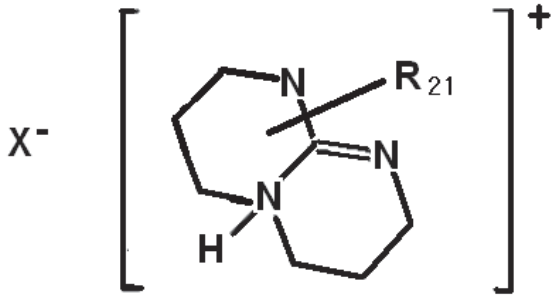
General Formula (1)

wherein at least one of R_1, R_2, R_3, and R_4 is a hydrogen atom, and at least one of R_1, R_2, R_3, and R_4 is a group which contains the linear hydrocarbon group having 10 or more carbon atoms,



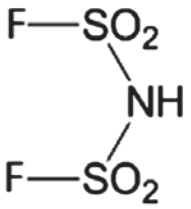
General Formula (2)

wherein R_{11} denotes the linear hydrocarbon group having 10 or more carbon atoms and being attached to a carbon atom in a bicyclo ring,

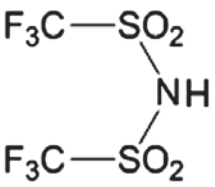


General Formula (3)

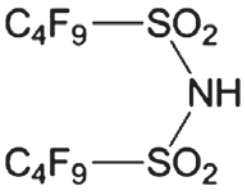
wherein R_{21} denotes the linear hydrocarbon group having 10 or more carbon atoms and being attached to a carbon atom or a nitrogen atom in a bicyclo ring.



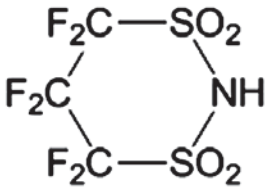
Structural Formula (A)



Structural Formula (B)



Structural Formula (C)

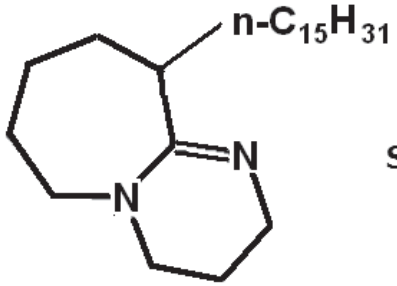


Structural Formula (D)

10. The ionic liquid according to claim 9, wherein the ionic liquid has an exothermic peak temperature determined by a differential thermal analysis (DTA) measurement of 370°C or higher.

11. The ionic liquid according to any one of claims 9 to 10, wherein the hydrocarbon group is an alkyl group.

12. The ionic liquid according to any one of claims 9 to 11, wherein the Bronsted base is octadecylamine ($C_{18}H_{37}NH_2$), decylamine ($C_{10}H_{21}NH_2$), tetradecylamine ($C_{14}H_{29}NH_2$), eicosylamine ($C_{20}H_{41}NH_2$), oleylamine ($C_{18}H_{35}NH_2$), 2-heptylundecylamine ($CH_3(CH_2)_9CH(C_7H_{15})NH_2$), or a compound represented by the following Structural Formula (1):



Structural Formula (1)

13. An ionic liquid,

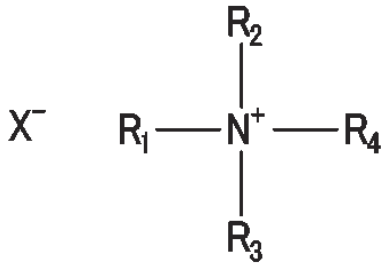
wherein the ionic liquid is formed from a Bronsted acid (HX) and a Bronsted base (B),

wherein the ionic liquid is represented by the following General Formula (1), (2) or (3),

wherein the Bronsted acid is perfluoroalkyl sulfonic acid, a compound represented by the following Structural Formula (A), a compound represented by the following Structural Formula (B), a compound represented by the following Structural Formula (C), or a compound

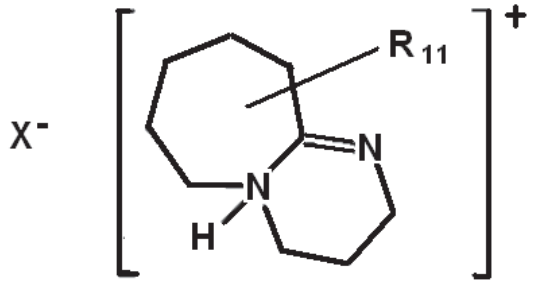
represented by the following Structural Formula (D), and

wherein a difference between a pKa value of the Bronsted acid in acetonitrile and a pKa value of the Bronsted base in acetonitrile is 17 or more:



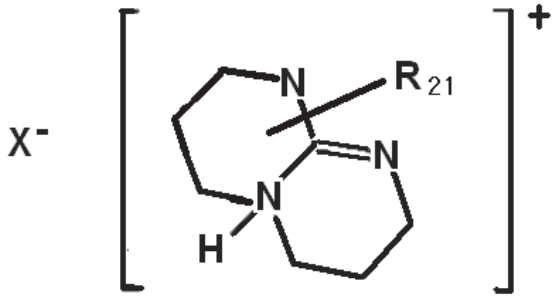
General Formula (1)

wherein at least one of R_1, R_2, R_3, and R_4 is a hydrogen atom, and at least one of R_1, R_2, R_3, and R_4 is a group which contains the linear hydrocarbon group having 10 or more carbon atoms,



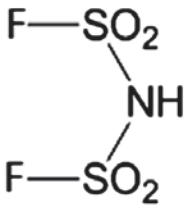
General Formula (2)

wherein R_{11} denotes the linear hydrocarbon group having 10 or more carbon atoms and being attached to a carbon atom in a bicyclo ring,

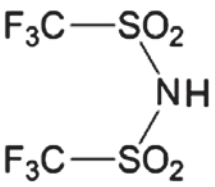


General Formula (3)

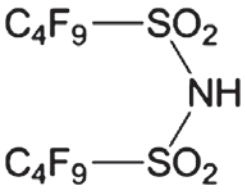
wherein R_{21} denotes the linear hydrocarbon group having 10 or more carbon atoms and being attached to a carbon atom or a nitrogen atom in a bicyclo ring.



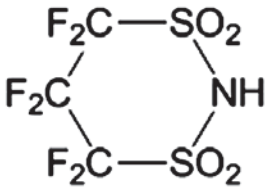
Structural Formula (A)



Structural Formula (B)



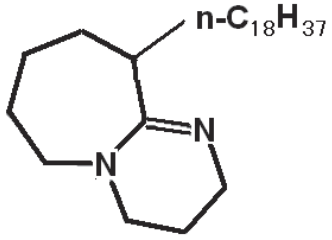
Structural Formula (C)



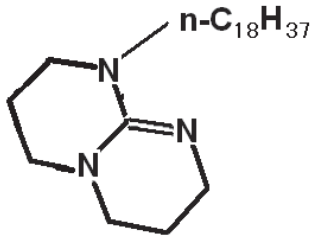
Structural Formula (D)

14. The ionic liquid according to claim 13, wherein the ionic liquid has an exothermic peak temperature determined by a differential thermal analysis (DTA) measurement of 370°C or higher.

15. The ionic liquid according to any one of claims 13 to 14, wherein the Bronsted base is octadecylamine ($C_{18}H_{37}NH_2$), decylamine ($C_{10}H_{21}NH_2$), tetradecylamine ($C_{14}H_{29}NH_2$), eicosylamine ($C_{20}H_{41}NH_2$), oleylamine ($C_{18}H_{35}NH_2$), 2-heptylundecylamine ($CH_3(CH_2)_9CH(C_7H_{15})NH_2$), a compound represented by the following Structural Formula (2), or a compound represented by the following Structural Formula (3):



Structural Formula (2)



Structural Formula (3)

CLAIMS

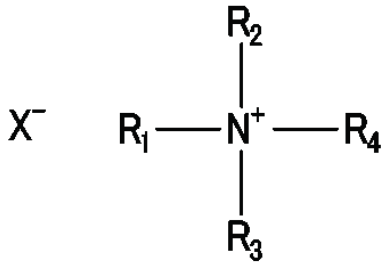
1. A lubricating agent, comprising:

an ionic liquid formed from a Bronsted acid (HX) and a Bronsted base (B),

wherein the Bronsted base has a linear hydrocarbon group having 10 or more carbon atoms, and

wherein a difference between a pKa value of the Bronsted acid in water and a pKa value of the Bronsted base in water is 12 or more.

2. The lubricating agent according to claim 1, wherein the ionic liquid is represented by the following General Formula (1):

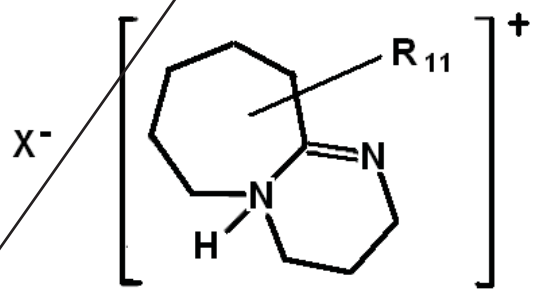


General Formula (1)

wherein at least one of R_1, R_2, R_3, and R_4 is a hydrogen atom, and at least one of R_1, R_2, R_3, and R_4 is a group which contains the linear hydrocarbon group having 10 or more carbon atoms.

3. The lubricating agent according to claim 1, wherein the Bronsted base is a cyclic amidine which contains the linear hydrocarbon group having 10 or more carbon atoms.

4. The lubricating agent according to claim 3, wherein the ionic liquid is represented by the following General Formula (2):



General Formula (2)

wherein R_{11} denotes the linear hydrocarbon group having 10 or more carbon atoms and being attached to a carbon atom in a bicyclo ring.

5. The lubricating agent according to any one of claims 1 to 4, wherein the Bronsted acid is sulfonic acid.

6. The lubricating agent according to any one of claims 1 to 5, wherein the ionic liquid has an exothermic peak temperature determined by a differential thermal analysis (DTA) measurement of 370°C or higher.

7. The lubricating agent according to any one of claims 1 to 5, wherein the hydrocarbon group is an alkyl group.

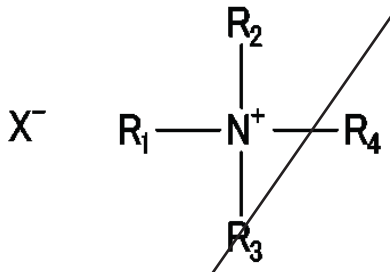
8. A lubricating agent, comprising:

an ionic liquid formed from a Bronsted acid (HX) and a Bronsted base (B),

wherein the Bronsted base has a linear hydrocarbon group having 10 or more carbon atoms, and

wherein a difference between a pKa value of the Bronsted acid in acetonitrile and a pKa value of the Bronsted base in acetonitrile is 6 or more.

9. The lubricating agent according to claim 8, wherein the ionic liquid is represented by the following General Formula (1):



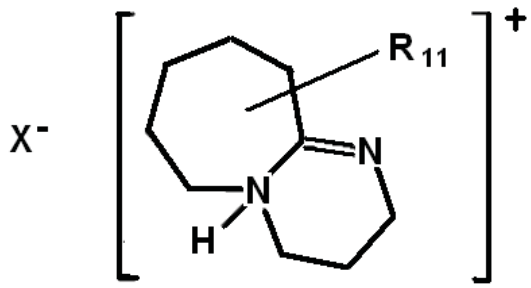
General Formula (1)

wherein at least one of R_1, R_2, R_3, and R_4 is a hydrogen atom, and at least one of R_1, R_2, R_3, and R_4 is a group which contains the linear hydrocarbon group having 10 or more carbon atoms.

10. The lubricating agent according to claim 8, wherein the Bronsted base is a cyclic amidine which contains the linear hydrocarbon group having 10 or more

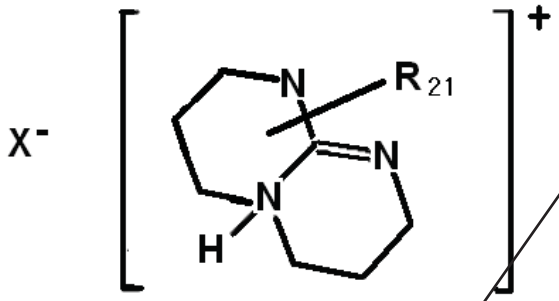
carbon atoms or a cyclic guanidine which contains the linear hydrocarbon group having 10 or more carbon atoms.

11. The lubricating agent according to claim 10, wherein the ionic liquid is represented by the following General Formula (2) or (3):



General Formula (2)

wherein R_{11} denotes the linear hydrocarbon group having 10 or more carbon atoms and being attached to a carbon atom in a bicyclo ring,

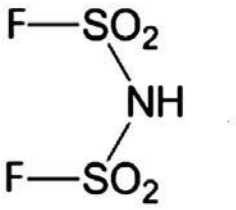


General Formula (3)

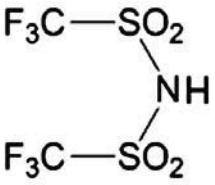
wherein R_{21} denotes the linear hydrocarbon group having 10 or more carbon atoms and being attached to a carbon atom or a nitrogen atom in a bicyclo ring.

12. The lubricating agent according to any one of claims 8 to 11, wherein the ionic liquid has an exothermic peak temperature determined by a differential thermal analysis (DTA) measurement of 370°C or higher.

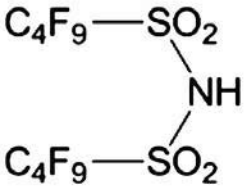
13. The lubricating agent according to any one of claims 8 to 12, wherein the Bronsted acid is perfluoroalkyl sulfonic acid, a compound represented by the following Structural Formula (A), a compound represented by the following Structural Formula (B), a compound represented by the following Structural Formula (C), or a compound represented by the following Structural Formula (D):



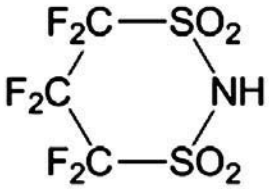
Structural Formula (A)



Structural Formula (B)



Structural Formula (C)



Structural Formula (D)

14. A magnetic recording medium, comprising:

a non-magnetic support; and

at least a magnetic layer on or above the non-magnetic support,

wherein the magnetic layer contains the lubricating agent according to any one of claims 1 to 13.

15. An ionic liquid,

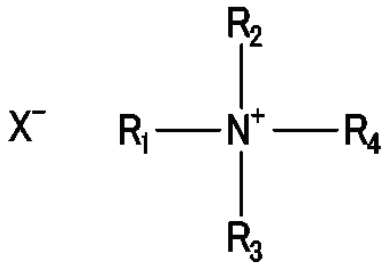
wherein the ionic liquid is formed from a Bronsted acid (HX) and a Bronsted base (B),

wherein the Bronsted base has a linear hydrocarbon group having 10 or more carbon atoms, and

wherein a difference between a pKa value of the Bronsted acid in water and a pKa value of the Bronsted base in water is 12 or more.

16. The ionic liquid according to claim 15, wherein the ionic liquid is

represented by the following General Formula (1):

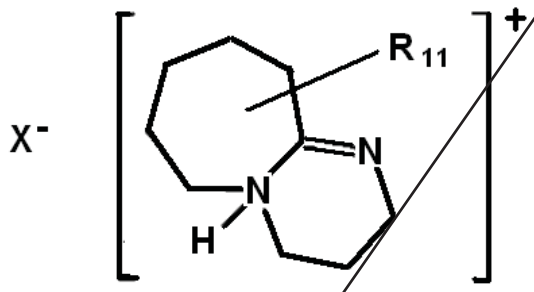


General Formula (1)

wherein at least one of R_1, R_2, R_3, and R_4 is a hydrogen atom, and at least one of R_1, R_2, R_3, and R_4 is a group which contains the linear hydrocarbon group having 10 or more carbon atoms.

17. The ionic liquid according to claim 15, wherein the Bronsted base is a cyclic amidine which contains the linear hydrocarbon group having 10 or more carbon atoms.

18. The ionic liquid according to claim 17, wherein the ionic liquid is represented by the following General Formula (2):



General Formula (2)

wherein R_{11} denotes the linear hydrocarbon group having 10 or more carbon atoms and being attached to a carbon atom in a bicyclo ring.

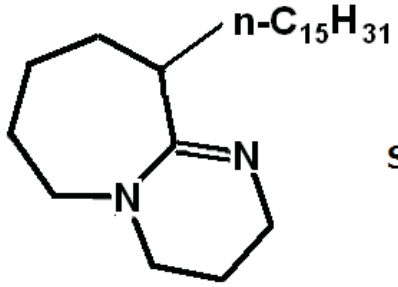
19. The ionic liquid according to any one of claims 15 to 18, wherein the Bronsted acid is sulfonic acid.

20. The ionic liquid according to any one of claims 15 to 19, wherein the ionic liquid has an exothermic peak temperature determined by a differential thermal analysis (DTA) measurement of 370°C or higher.

21. The ionic liquid according to any one of claims 15 to 20, wherein the

hydrocarbon group is an alkyl group.

22. The ionic liquid according to any one of claims 15 to 21, wherein the Bronsted base is octadecylamine ($C_{18}H_{37}NH_2$), decylamine ($C_{10}H_{21}NH_2$), tetradecylamine ($C_{14}H_{29}NH_2$), eicosylamine ($C_{20}H_{41}NH_2$), oleylamine ($C_{18}H_{35}NH_2$), 2-heptylundecylamine ($CH_3(CH_2)_nCH(C_7H_{15})NH_2$), or a compound represented by the following Structural Formula (1):



Structural Formula (1)

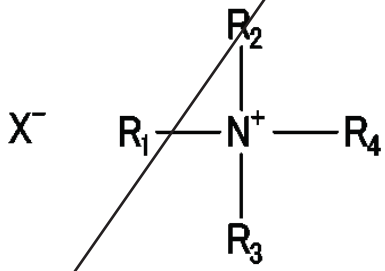
23. An ionic liquid,

wherein the ionic liquid is formed from a Bronsted acid (HX) and a Bronsted base (B),

wherein the Bronsted base has a linear hydrocarbon group having 10 or more carbon atoms, and

wherein a difference between a pKa value of the Bronsted acid in acetonitrile and a pKa value of the Bronsted base in acetonitrile is 6 or more.

24. The ionic liquid according to claim 23, wherein the ionic liquid is represented by the following General Formula (1):



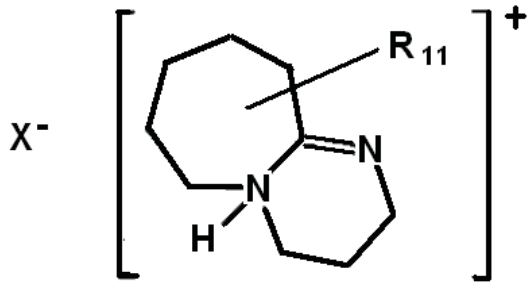
General Formula (1)

wherein at least one of R_1, R_2, R_3, and R_4 is a hydrogen atom, and at least one of R_1, R_2, R_3, and R_4 is a group which contains the linear hydrocarbon group

having 10 or more carbon atoms.

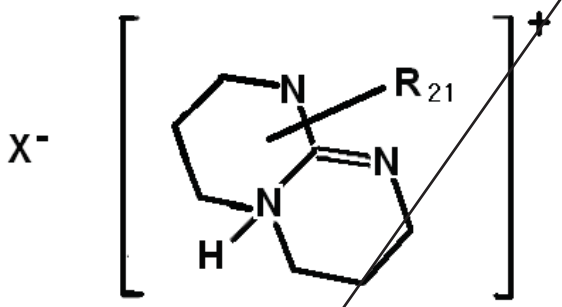
25. The ionic liquid according to claim 23, wherein the Bronsted base is a cyclic amidine which contains the linear hydrocarbon group having 10 or more carbon atoms or a cyclic guanidine which contains the linear hydrocarbon group having 10 or more carbon atoms.

26. The ionic liquid according to claim 25, wherein the ionic liquid is represented by the following General Formula (2) or (3):



General Formula (2)

wherein R_{11} denotes the linear hydrocarbon group having 10 or more carbon atoms and being attached to a carbon atom in a bicyclo ring,



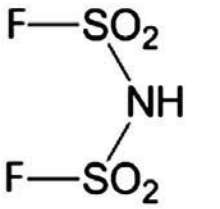
General Formula (3)

wherein R_{21} denotes the linear hydrocarbon group having 10 or more carbon atoms and being attached to a carbon atom or a nitrogen atom in a bicyclo ring.

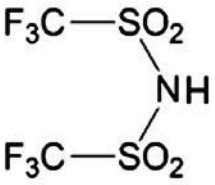
27. The ionic liquid according to any one of claims 23 to 26, wherein the ionic liquid has an exothermic peak temperature determined by a differential thermal analysis (DTA) measurement of 370°C or higher.

28. The ionic liquid according to any one of claims 23 to 27, wherein the Bronsted acid is perfluoroalkyl sulfonic acid, a compound represented by the following Structural Formula (A), a compound represented by the following

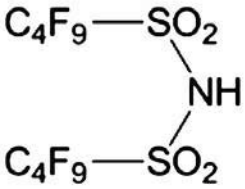
Structural Formula (B), a compound represented by the following Structural Formula (C), or a compound represented by the following Structural Formula (D):



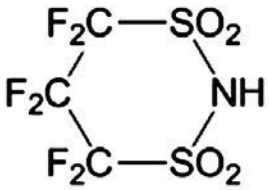
Structural Formula (A)



Structural Formula (B)

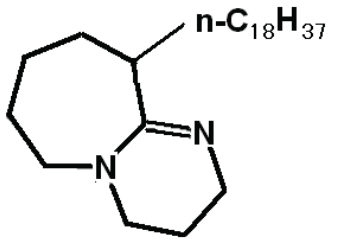


Structural Formula (C)

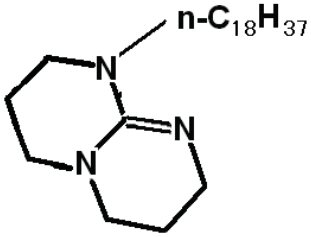


Structural Formula (D)

29. The ionic liquid according to any one of claims 23 to 28, wherein the Bronsted base is octadecylamine ($C_{18}H_{37}NH_2$), decylamine ($C_{10}H_{21}NH_2$), tetradecylamine ($C_{14}H_{29}NH_2$), eicosylamine ($C_{20}H_{41}NH_2$), oleylamine ($C_{18}H_{35}NH_2$), 2-heptylundecylamine ($CH_3(CH_2)_nCH(C_7H_{15})NH_2$), a compound represented by the following Structural Formula (2), or a compound represented by the following Structural Formula (3):



Structural Formula (2)



Structural Formula (3)