CLAIMS

1. A process for the removal of mercury from a mercury-containing hydrocarbon fluid feed, the process comprising the steps of:

   (i) contacting the mercury-containing hydrocarbon fluid feed with an ionic liquid having the formula:

   $$[Cat^+][M^+][X^-]$$

   wherein: $[Cat^+]$ represents one or more organic cationic species,

   $[M^+]$ represents one or more metal cations selected from transition metal cations having an oxidation state of +2 or greater,

   $[X^-]$ represents one or more anionic species; and

   (ii) separating from the ionic liquid a hydrocarbon fluid product having a reduced mercury content compared to the mercury-containing fluid feed.

2. A process according to Claim 1, wherein $[M^+]$ represents one or more metal cations having an oxidation state of at least +2 selected from first row transition metal cations and molybdenum cations.

3. A process according to Claim 2, wherein $[M^+]$ represents one or more metal cations having an oxidation state of at least +2 selected from iron cations, copper cations, molybdenum cations and cobalt cations

4. A process according to Claim 3, wherein $[M^+]$ represents one or more metal cations selected from Fe^{3+}, Cu^{2+}, Mo^{6+}, and Co^{2+}.

5. A process according to Claim 4, wherein $[M^+]$ represents Fe^{3+}.

6. A process according to Claim 4, wherein $[M^+]$ represents Cu^{2+}.

7. A process according to any one of the preceding claims, wherein the mercury concentration in the mercury-containing hydrocarbon fluid feed is in the range of from 1 to 250,000 parts per billion.

8. A process according to any one of the preceding claims, wherein the hydrocarbon fluid feed comprises at least one of elemental mercury, particulate mercury, or organic mercury.

9. A process according to any one of the preceding claims, wherein the mercury-containing hydrocarbon fluid feed is a liquid.

10. A process according to Claim 9, wherein the mercury-containing hydrocarbon fluid feed comprises one or more of:

    (i) a liquefied natural gas;

    (ii) a light distillate comprising liquid petroleum gas, gasoline, and/or naphtha;

    (iii) a natural gas condensate;

    (iv) a middle distillate comprising kerosene and/or diesel;

    (v) a heavy distillate; and

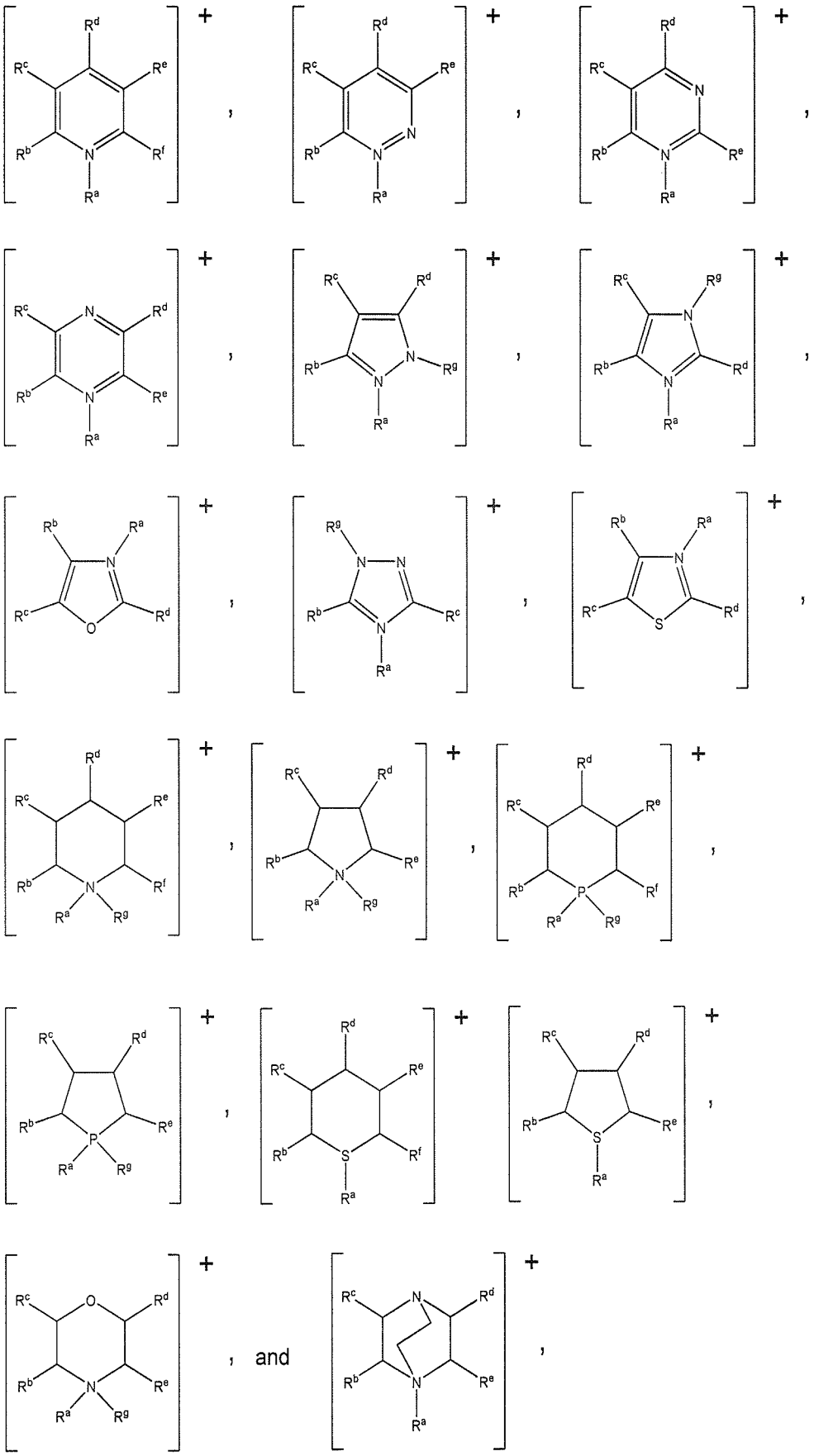
    (vi) a crude oil.

11. A process according any one of Claims 1 to 8, wherein the mercury-containing hydrocarbon fluid feed is a gas.

12. A process according to Claim 11, wherein the mercury-containing hydrocarbon fluid feed comprises natural gas and/or refinery gas.

13. A process according to any one of the preceding claims, wherein [Cat^+] comprises a cationic species selected from the group consisting of: ammonium, benzimidazolium, benzofuranium, benzothiophenium, benzotriazolium, borolium, cinnolinium, diazabicyclodecenium, diazabicyclononenium, 1,4-diazabicyclo-[2.2.2]octanium, diazabicyclo-undecenium, dithiazolium, furanium, guanidinium, imidazolium, indazolium, indolinium, indolium, morpholinium, oxaborolium, oxaphospholium, oxazinium, oxazolium, *iso*-oxazolium, oxothiazolium, phospholium, phosphonium, phthalazinium, piperazinium, piperidinium, pyranium, pyrazinium, pyrazolium, pyridazinium, pyridinium, pyrimidinium, pyrrolidinium, pyrrolium, quinazolinium, quinolinium, *iso*-quinolinium, quinoxalinium, quinuclidinium, selenazolium, sulfonium, tetrazolium, thiadiazolium, *iso*-thiadiazolium, thiazinium, thiazolium, *iso*-thiazolium, thiophenium, thiuronium, triazinium, triazolium, *iso*-triazolium, and uronium.

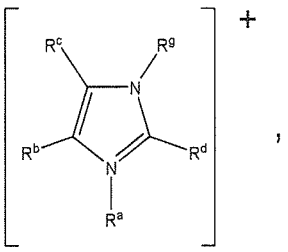
14. A process according to Claim 13, wherein [Cat^+] comprises a cationic species selected from the group consisting of:



and

wherein: R^a, R^b, R^c, R^d, R^e, R^f and R^g are each independently selected from hydrogen, a C_1 to C_{20}, straight chain or branched alkyl group, a C_3 to C_8 cycloalkyl group, or a C_6 to C_{10} aryl group, or any two of R^b, R^c, R^d, R^e and R^f attached to adjacent carbon atoms form a methylene chain $-(CH_2)_q-$ wherein q is from 3 to 6; and wherein said alkyl, cycloalkyl or aryl groups or said methylene chain are unsubstituted or may be substituted by one to three groups selected from: C_1 to C_6 alkoxy, C_2 to C_{12} alkoxyalkoxy, C_3 to C_8 cycloalkyl, C_6 to C_{10} aryl, C_7 to C_{10} alkaryl, C_7 to C_{10} aralkyl, -CN, -OH, -SH, $-NO_2$, $-CO_2R^x$, $-OC(O)R^x$, $-C(O)R^x$, $-C(S)R^x$, $-CS_2R^x$, $-SC(S)R^x$, $-S(O)$(C_1 to C_6)alkyl, $-S(O)O$(C_1 to C_6)alkyl, $-OS(O)$(C_1 to C_6)alkyl, $-S$(C_1 to C_6)alkyl, -S-S(C_1 to C_6 alkyl), $-NR^xC(O)NR^yR^z$, $-NR^xC(O)OR^y$, $-OC(O)NR^yR^z$, $-NR^xC(S)OR^y$, $-OC(S)NR^yR^z$, $-NR^xC(S)SR^y$, $-SC(S)NR^yR^z$, $-NR^xC(S)NR^yR^z$, $-C(O)NR^yR^z$, $-C(S)NR^yR^z$, $-NR^yR^z$, or a heterocyclic group, wherein R^x, R^y and R^z are independently selected from hydrogen or C_1 to C_6 alkyl.

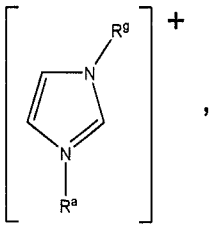
15. A process according to according to Claim 14, wherein [Cat^+] comprises a cationic species selected from:



,

wherein: R^a, R^b, R^c, R^d, R^e, R^f, and R^g are as defined in Claim 14.

16. A process according to according to Claim 15, wherein [Cat^+] comprises a cationic species selected from:



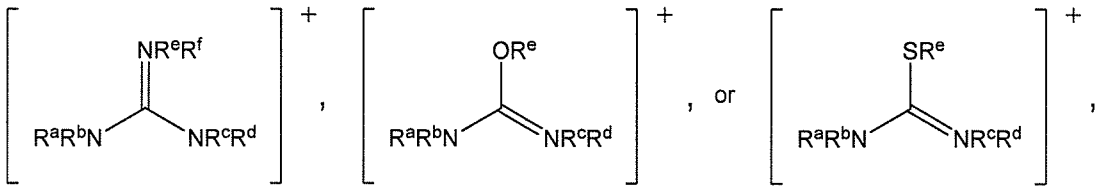
wherein: R^a and R^g are as defined in Claim 14.

17. A process according to Claim 13, wherein [Cat^+] is selected from the group consisting of:

$[N(R^a)(R^b)(R^c)(R^d)]^+$, $[P(R^a)(R^b)(R^c)(R^d)]^+$, and $[S(R^a)(R^b)(R^c)]^+$,

wherein: R^a, R^b, R^c, and R^d are each independently selected from a C_1 to C_{20}, straight chain or branched alkyl group, a C_3 to C_8 cycloalkyl group, or a C_6 to C_{10} aryl group; and wherein said alkyl, cycloalkyl or aryl groups are unsubstituted or may be substituted by one to three groups selected from: C_1 to C_6 alkoxy, C_2 to C_{12} alkoxyalkoxy, C_3 to C_8 cycloalkyl, C_6 to C_{10} aryl, C_7 to C_{10} alkaryl, C_7 to C_{10} aralkyl, -CN, -OH, -SH, $-NO_2$, $-CO_2R^x$, $-OC(O)R^x$, $-C(O)R^x$, $-C(S)R^x$, $-CS_2R^x$, $-SC(S)R^x$, $-S(O)(C_1$ to $C_6)$alkyl, $-S(O)O(C_1$ to $C_6)$alkyl, $-OS(O)(C_1$ to $C_6)$alkyl, $-S(C_1$ to $C_6)$alkyl, -S-S(C_1 to C_6 alkyl), $-NR^xC(O)NR^yR^z$, $-NR^xC(O)OR^y$, $-OC(O)NR^yR^z$, $-NR^xC(S)OR^y$, $-OC(S)NR^yR^z$, $-NR^xC(S)SR^y$, $-SC(S)NR^yR^z$, $-NR^xC(S)NR^yR^z$, $-C(O)NR^yR^z$, $-C(S)NR^yR^z$, $-NR^yR^z$, or a heterocyclic group, wherein R^x, R^y and R^z are independently selected from hydrogen or C_1 to C_6 alkyl, and wherein one of R^a, R^b, R^c, and R^d may also be hydrogen.

18. A process according to Claim 13, wherein [Cat^+] is selected from the group consisting of:



wherein: R^a, R^b, R^c, R^d, R^e, and R^f are as defined in Claim 14.

19. A process according to any one of the preceding claims, wherein $[X^-]$ comprises an anion selected from halides, perhalides, pseudohalides, sulphates, sulphites, sulfonates, sulfonimides, phosphates, phosphites, phosphonates, methides, borates, carboxylates, azolates, carbonates, carbamates, thiophosphates, thiocarboxylates, thiocarbamates, thiocarbonates, xanthates, thiosulfonates, thiosulfates, nitrate, nitrite, perchlorate, halometallates, amino acids and borates.

20. A process according to Claim 19, wherein $[X^-]$ comprises or consists of one or more anions selected from $[F]^-$, $[Cl]^-$, $[Br]^-$, $[I]^-$, $[I_3]^-$, $[I_2Br]^-$, $[IBr_2]^-$, $[Br_3]^-$, $[Br_2C]^-$, $[BrCl_2]^-$, $[ICl_2]^-$, $[I_2Cl]^-$, $[Cl_3]^-$, $[N_3]^-$, $[NCS]^-$, $[NCSe]^-$, $[NCO]^-$, $[CN]^-$, $[HSO_4]^-$, $[SO_4]^{2-}$, $[R^2OSO_2O]^-$, $[HSO_3]^-$, $[SO_3]^{2-}$, $[R^2OSO_2]^-$, $[R^1SO_2O]^-$, $[(R^1SO_2)_2N]^-$, $[H_2PO_4]^-$, $[HPO_4]^{2-}$, $[PO_4]^{3-}$, $[R^2OPO_3]^{2-}$, $[(R^2O)_2PO_2]^-$, $[H_2PO_3]^-$, $[HPO_3]^{2-}$, $[R^2OPO_2]^{2-}$, $[(R^2O)_2PO]^-$, $[R^1PO_3]^{2-}$, $[R^1P(O)(OR^2)O]^-$, $[(R^1SO_2)_3C]^-$, [bisoxalatoborate], [bismalonatoborate], $[R^2CO_2]^-$, [3,5-dinitro-1,2,4-triazolate], [4-nitro-1,2,3-triazolate], [2,4-dinitroimidazolate], [4,5-dinitroimidazolate], [4,5-dicyano-imidazolate], [4-nitroimidazolate], [tetrazolate], $[R^2OCS_2]^-$, $[R^2{}_2NCS_2]^-$, $[R^1CS_2]^-$, $[(R^2O)_2PS_2]^-$, $[RS(O)_2S]^-$, $[ROS(O)_2S]^-$, $[NO_3]$ and $[NO_2]^-$.

wherein: R^1 and R^2 are independently selected from the group consisting of C_1-C_{10} alkyl, C_6 aryl, C_1-C_{10} alkyl(C_6)aryl, and C_6 aryl(C_1-C_{10})alkyl each of which may be substituted by one or more groups selected from: fluoro, chloro, bromo, iodo, C_1 to C_6 alkoxy, C_2 to C_{12} alkoxyalkoxy, C_3 to C_8 cycloalkyl, C_6 to C_{10} aryl,

C_7 to C_{10} alkaryl, C_7 to C_{10} aralkyl, -CN, -OH, -SH, $-NO_2$, $-CO_2R^x$, $-OC(O)R^x$, $-C(O)R^x$, $-C(S)R^x$, $-CS_2R^x$, $-SC(S)R^x$, $-S(O)(C_1$ to $C_6)$alkyl, $-S(O)O(C_1$ to $C_6)$alkyl, $-OS(O)(C_1$ to $C_6)$alkyl, $-S(C_1$ to $C_6)$alkyl, $-S\text{-}S(C_1$ to C_6 alkyl), $-NR^xC(O)NR^yR^z$, $-NR^xC(O)OR^y$, $-OC(O)NR^yR^z$, $-NR^xC(S)OR^y$, $-OC(S)NR^yR^z$, $-NR^xC(S)SR^y$, $-SC(S)NR^yR^z$, $-NR^xC(S)NR^yR^z$, $-C(O)NR^yR^z$, $-C(S)NR^yR^z$, $-NR^yR^z$, or a heterocyclic group, wherein R^x, R^y and R^z are independently selected from hydrogen or C_1 to C_6 alkyl, and wherein R^1 may also be fluorine, chlorine, bromine or iodine.

21. A process according to Claim 20, wherein $[X^-]$ comprises or consists of one or more anions selected from $[F]^-$, $[Cl]^-$, $[Br]^-$, $[I]^-$, $[N_3]^-$, $[NCS]^-$, $[NCSe]^-$, $[NCO]^-$, $[CN]^-$, $[SO_4]^{2-}$, $[R^2OSO_2O]^-$, $[HSO_3]^-$, $[SO_3]^{2-}$, $[R^2OSO_2]^-$, $[R^1SO_2O]^-$, $[(R^1SO_2)_2N]^-$, $[PO_4]^{3-}$, $[R^2OPO_3]^{2-}$, $[(R^2O)_2PO_2]^-$, $[HPO_3]^{2-}$, $[R^2OPO_2]^{2-}$, $[(R^2O)_2PO]^-$, $[R^1PO_3]^{2-}$, $[R^1P(O)(OR^2)O]^-$, $[(R^1SO_2)_3C]^-$, [bisoxalatoborate], [bismalonatoborate], $[R^2CO_2]^-$, [3,5-dinitro-1,2,4-triazolate], [4-nitro-1,2,3-triazolate], [2,4-dinitroimidazolate], [4,5-dinitroimidazolate], [4,5-dicyano-imidazolate], [4-nitroimidazolate], [tetrazolate], $[R^2OCS_2]^-$, $[R^2{}_2NCS_2]^-$, $[R^1CS_2]^-$, $[(R^2O)_2PS_2]^-$, $[RS(O)_2S]^-$, $[ROS(O)_2S]^-$, $[NO_3]^-$ and $[NO_2]^-$, wherein R^1 and R^2 are as defined in Claim 20.

22. A process according to Claim 21, wherein $[X^-]$ comprises or consists of one or more anions selected from: $[F]^-$, $[Cl]^-$, $[Br]^-$, $[I]^-$, $[N_3]^-$, $[NCS]^-$, $[NCSe]^-$, $[NCO]^-$, $[CN]^-$, $[R^2CO_2]^-$, and $[SO_4]^{2-}$, wherein R^2 is as defined in Claim 20.

23. A process according to Claim 22, wherein $[X^-]$ comprises or consists of one or more anions selected from: $[F]^-$, $[Cl]^-$, $[Br]^-$, and $[I]^-$.

24. A process according to Claim 22, wherein $[X^-]$ comprises or consists of one or more anions selected from: $[N_3]^-$, $[NCS]^-$, $[NCSe]^-$, $[NCO]^-$, and $[CN]^-$.

25. A process according to Claim 22, wherein [X^-] comprises or consists of one or more anions selected from: [$HCO_2]^-$, [$MeCO_2]^-$, [$EtCO_2]^-$, [$CH_2(OH)CO_2]^-$, [$CH_3CH(OH)CH_2CO_2]^-$, and [$PhCO_2]^-$.

26. A process according to Claim 22, wherein [X^-] comprises or consists of [$SO_4]^{2-}$.

27. A process according to any one of the preceding claims, wherein the molar ratio of [Cat^+] and [M^+] in the ionic liquid is in the range of from 10:1 to 1:2.

28. A process according to Claim 27, wherein the molar ratio of [Cat^+] and [M^+] in the ionic liquid is in the range of from 2:1 to 1:1.

29. A process according to any one of the preceding claims, wherein the ionic liquid is prepared by adding a salt of the metal cation [M^+] to an ionic liquid having the formula [Cat^+][X^-], wherein [Cat^+] and [X^-] are as defined in Claim 1.

30. A process according to Claim 29, wherein the salt comprises a halide anion.

31. A process according to Claim 30, wherein the salt is selected from $FeCl_3$, $FeBr_3$, $CuCl_2$, and $CuBr_2$.

32. A process according to any one of the preceding claims, wherein the metal cation [M^+] is combined with one or more ligands to form a coordination complex.

33. A process according to Claim 32, wherein the coordination complex has the formula:

$$[(M^{x+})_n(L^{y-})_m]^{(nx-my)}$$

wherein: each M^{x+} independently represents a metal ion $[M^+]$ as defined in any one of Claims 1 to 6, having a charge of x+;

each L^{y-} independently represents a ligand having a charge of y-;

n is 1, 2 or 3;

m is 2, 3, 4, 5, 6, 7 or 8;

x is 2, 3, 4, 5 or 6; and

y is 0, 1, 2 or 3.

34. A process according to Claim 33, wherein each L^{y-} is an anionic species independently selected from $[X^-]$ as defined in any one of Claims 19 to 26, $[O^{2-}]$ and $[S^{2-}]$.

35. A process according to Claim 34, wherein each L^{y-} is an anionic species independently selected from halide anions, perhalide ions, carboxylate anions, $[O^{2-}]$ and $[S^{2-}]$.

36. A process according to Claim 35, wherein each L^{y-} is an anionic species independently selected from $[F]^-$, $[Cl]^-$, $[Br]^-$, $[I]^-$, $[N_3]^-$, $[NCS]^-$, $[NCSe]^-$, $[NCO]^-$, $[CN]^-$, $[R^2CO_2]^-$, wherein R^2 is as defined above, $[O^{2-}]$ and $[S^{2-}]$.

37. A process according to any one of Claims 33 to 36, wherein $[(M^{x+})_n(L^{y-})_m]^{(nx-my)}$ represents a metallate anion.

38. A process according to Claim 37, wherein the metallate anion is selected from $[FeCl_4]^-$, $[CuCl_4]^{2-}$, $[Cu_2Cl_6]^{2-}$ and $[MoS_4]^{2-}$.

39. A process according to any one of the preceding claims, wherein the ionic liquid has a melting point of 250 °C or less.

40. A process according to Claim 39, wherein the ionic liquid has a melting point of 30 °C or less.

41. A process according to any one of the preceding claims, wherein the ionic liquid is immiscible with the mercury-containing hydrocarbon fluid feed and the hydrocarbon fluid product.

42. A process according to any one of the preceding claims, wherein the ionic liquid is immobilised on a solid support material.

43. A process for the removal of mercury from a mercury-containing hydrocarbon fluid feed, the process comprising the steps of:

(i) contacting the mercury-containing hydrocarbon fluid feed with an ionic liquid immobilised on a solid support material, where the ionic liquid has the formula:

$$[Cat^+][M^+][X^-]$$

wherein: $[Cat^+]$ represents one or more organic cationic species,

$[M^+]$ represents one or more metal cations selected from transition metal cations having an oxidation state of +2 or greater.

$[X^-]$ represents one or more anionic species;

(ii) separating from the ionic liquid a hydrocarbon fluid product having a reduced mercury content compared to the mercury-containing fluid feed.

44. A process according to Claim 43, wherein the ionic liquid is as defined in any one of Claims 2 to 6 and 13 to 40.

45. A process according to any one of Claims 42 to 44, wherein the solid support material comprises or consists of a porous support material having a BET surface area of from 10 $m^2 \cdot g^{-1}$ to 3000 $m^2 \cdot g^{-1}$.

46. A process according to any one of Claims 42 to 45, wherein the solid support material comprises or consists of a porous support material having a BET surface area of from 100 $m^2 \cdot g^{-1}$ to 1000 $m^2 \cdot g^{-1}$.

~~46.~~47. A process according to Claim 45 or Claim 46, wherein the solid support material comprises or consists of a porous support material having a BET surface area of from 100 to 300 $m^2\ g^{-1}$.

~~47.~~48. A process according to any one of Claims 42 to ~~46~~47, wherein the solid support material is in the form of pellets, granules or beads having a mass mean diameter in the range of from 0.1 to 100 mm.

~~48.~~49. A process according to any one of Claims 42 to ~~47~~48, wherein the solid support material is selected from silica, alumina, silica-alumina, and activated carbon.

~~49.~~50. A process according to Claim ~~48~~49, wherein the solid support material is silica.

51. A process according to Claim 49, wherein the solid support material is activated carbon.

~~50.~~52. A process according to any one of Claims 42 to ~~49~~51, wherein from 1 to 50 wt% of ionic liquid is immobilised on the solid support material, based on the total weight of ionic liquid and solid support material.

~~51.~~53. A process according to any one of the preceding claims, wherein the ionic liquid and the mercury-containing hydrocarbon fluid feed are contacted in a volume ratio of from 1:1 to 1:10,000.

~~52.~~54. A process according to any one of the preceding claims, wherein 1 to 10,000 moles of ionic liquid are contacted with the mercury-containing hydrocarbon fluid feed per mole of the mercury in the mercury-containing hydrocarbon fluid feed.

~~53.~~55. A process according to any one of the preceding claims, wherein the ionic liquid is contacted with the mercury-containing hydrocarbon fluid feed at a temperature of from 0 °C to 250 °C.

~~54.~~56. A process according to any one of the preceding claims, wherein the ionic liquid is contacted with the mercury-containing hydrocarbon fluid feed at atmospheric pressure.

~~55.~~57. A process according to any one of the preceding claims, wherein the mercury-containing hydrocarbon feed and the ionic liquid are contacted for a period of from 0.1 minute to 5 hours.

~~56. A process for the removal of mercury from a mercury-containing hydrocarbon fluid feed, the process comprising the steps of:~~

~~(i) contacting the mercury-containing hydrocarbon fluid feed with a metallate salt immobilised on a solid support material, where the metallate salt has the formula:~~

~~$[Q^+][(M^{x+})_n(L^{y-})_m]^{(nx-my)}$~~

~~wherein: each M^{x+} independently represents a metal cation $[M^+]$ as defined in any one of Claims 1 to 5, having a charge of x+;~~

~~each L^{y-} independently represents a ligand having a charge of y-;~~

~~n is 1, 2 or 3;~~

~~m is 2, 3, 4, 5, 6, 7 or 8;~~

~~x is 2, 3, 4, 5 or 6;~~

~~y is 0, 1, 2 or 3,~~

(nx-my) is a negative number, and

$[Q^+]$ represents one or more inorganic cations having a total charge of (my-nx); and

(ii) separating from the ionic liquid a hydrocarbon fluid product having a reduced mercury content compared to the mercury-containing fluid feed.

57. A process according to Claim 56, wherein each L^{y-} is an anionic species independently selected from $[X^-]$ as defined in any one of Claims 19 to 26, $[O^{2-}]$ and $[S^{2-}]$.

58. A process according to Claim 57, wherein each L^{y-} is an anionic species independently selected from $[F]^-$, $[Cl]^-$, $[Br]^-$, $[I]^-$, $[N_3]^-$, $[NCS]^-$, $[NCSe]^-$, $[NCO]^-$, $[CN]^-$, $[R^2CO_2]^-$, wherein R^2 is as defined above, $[O^{2-}]$ and $[S^{2-}]$.

59. A process according to Claim 58, wherein the metallate salt comprises a metallate anion selected from $[FeCl_4]^-$, $[CuCl_4]^{2-}$, $[Cu_2Cl_6]^{2-}$ and $[MoS_4]^{2-}$.

60. A process according to any one of Claims 56 to 59, wherein $[Q^+]$ represents one or more ions selected from $[Li]^+$, $[Na]^+$, $[K]^+$, $[Mg]^{2+}$, $[Ca]^{2+}$, and $[NH_4]^+$.

61. A process according to any one of Claims 56 to 60, wherein the solid support material is as defined in any one of Claims 45 to 49.

62. A process according to any one of Claims 56 to 61, wherein the solid-supported metallate salt is contacted with the mercury-containing hydrocarbon fluid feed at a temperature of from 0 °C to 250 °C.

~~63. A process according to any one of Claims 56 to 62, wherein the solid-supported metallate salt is contacted with the mercury-containing hydrocarbon fluid feed at atmospheric pressure.~~

~~64. A process according to any one of Claims 56 to 63, wherein the mercury-containing hydrocarbon feed and the solid-supported metallate salt are contacted for a period of from 0.1 minute to 5 hours.~~

~~65.~~58. A process according to any one of the preceding claims, wherein the hydrocarbon fluid product contains less than 40 wt% of the mercury content of the mercury-containing hydrocarbon fluid feed.

~~66.~~59. A process according to Claim ~~65~~58, wherein the hydrocarbon fluid product contains less than 5 wt% of the mercury content of the mercury-containing hydrocarbon fluid feed.

~~67.~~60. A process according to anyone of the preceding claims, wherein the hydrocarbon fluid product contains less than 50 ppb mercury.

~~68.~~61. A process according to Claim ~~67~~60, wherein the hydrocarbon fluid product contains less than 1 ppb mercury.

~~69.~~62. Use of an ionic liquid as defined in any one of Claims 1 to 6 and 13 to 42 for the removal of mercury from a mercury-containing hydrocarbon fluid.

~~70.~~63. Use of an ionic liquid immobilised on a solid support material as defined in any one of Claims 43 to ~~50~~ 52 for the removal of mercury from a mercury-containing hydrocarbon fluid.

~~71. Use of a metallate salt immobilised on a solid support material as defined in any one of Claims 56 to 61 for the removal of mercury from a mercury-containing hydrocarbon fluid.~~