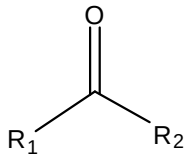
CLAIMS

1. A thermo-responsive osmotic solution having a lower critical solution temperature in a solvent, the thermo-responsive osmotic solution comprising:

a) at least one tertiary amine containing compound; and

b) at least one enolisable carbonyl of Formula I,



Formula I

wherein

i) R_1 and R_2 are independently selected from a -C_1-C_7 alkyl, a -C_3-C_7 monocyclic or a -phenyl; or

ii) one of R_1 or R_2 is selected from a -O-(C_1-C_7) alkyl) and the other is selected from a -C_1-C_7 alkyl; or

iii) the carbonyl of Formula I forms

a. a 3-15 membered monocyclic ketone; or

b. a 3-15 membered monocyclic heterocyclic ketone; or

c. acetophenone;

wherein the at least one tertiary amine containing compound or the at least one enolisable carbonyl compound is immiscible with the solvent at or above 20 degrees Celsius and at 1 atmosphere; and wherein the solvent is water.

2. The solution as claimed in claim 1, wherein the solution comprises a combination of more than one enolisable carbonyl compound of Formula I.

3. The solution as claimed in claim 2, wherein the one or more enolisable carbonyl compounds of Formula I are selected from acetone, acetophenone, methylethylketone (2-butanone), cyclohexanone, cyclopentanone, 2-propanone, 2-pentanone, 3-pentanone, 4-methyl-2-pentanone, 2-octanone and 3-methyl-2-butanone, or a combination thereof.

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4. The solution as claimed in claim 1, wherein the solution comprises a combination of more than one tertiary amine containing compound.

5. The solution as claimed in claim 1, wherein at least one tertiary amine containing compound in the solution is a Lewis base.

6. The solution as claimed in claim 5, wherein the Lewis base forms a Lewis adduct with at least one enolisable carbonyl compound of Formula I.

7. The solution as claimed in claim 5, wherein the solution comprises a molar ratio of the Lewis base to the at least one enolisable carbonyl compound of Formula I of about 1:99 or 99:1.

8. The solution as claimed in claim 7, wherein the molar ratio of the Lewis base to the at least one enolisable carbonyl compound of Formula I is about 1:50 or 50:1.

9. The solution as claimed in claim 7, wherein the molar ratio of the Lewis base to the at least one enolisable carbonyl compound of Formula I is about 1:10 or 10:1.

10. The solution as claimed in claim 7, wherein the molar ratio of the Lewis base to the at least one enolisable carbonyl compound of Formula I is about 1:5 or 5:1.

11. The solution as claimed in claim 7, wherein the molar ratio of the Lewis base to the at least one enolisable carbonyl compound of Formula I is about 1:3 or 3:1.

12. The solution as claimed in claim 7, wherein the molar ratio of the Lewis base to the at least one enolisable carbonyl compound of Formula I is about 1:2 or 2:1.

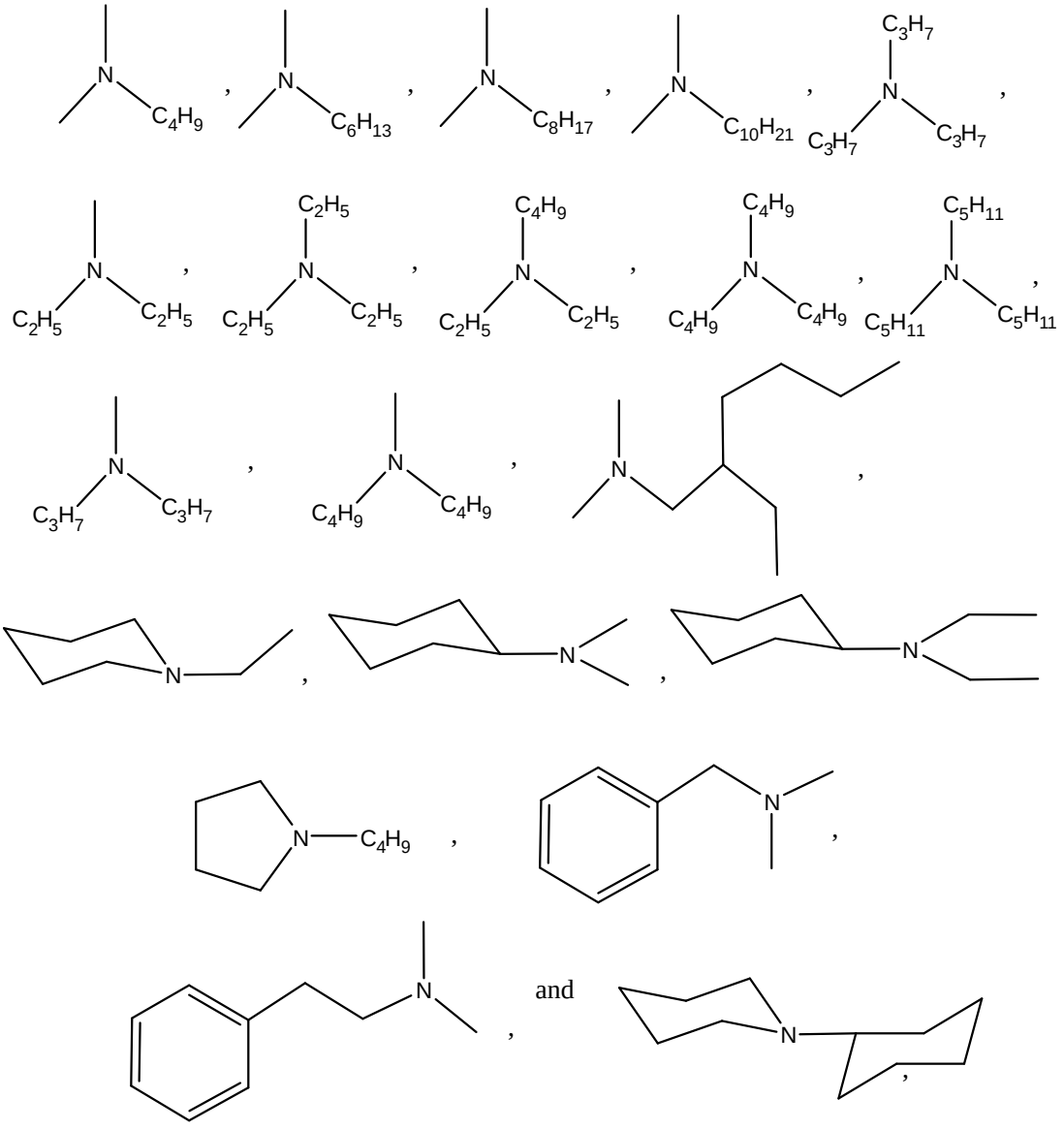
13. The solution as claimed in claim 7, wherein the molar ratio of the Lewis base to the at least one enolisable carbonyl compound of Formula I is about 1:1.

14. The solution as claimed in claim 1, wherein at least one tertiary amine containing compound in the solution is immiscible with the solvent at or above 20 degrees Celsius and at 1 atmosphere.

15. The solution as claimed in claim 1, wherein at least one tertiary amine containing

compound in the solution is selected from a conjugated, aliphatic, asymmetric or cyclic tertiary amine.

16. The solution as claimed in claim 15, wherein at least one tertiary amine containing compound in the solution is selected from:



17. The solution as claimed in claim 15, wherein at least one tertiary amine containing compound in the solution is a -N(C_1-C_7 alkyl)$_3$.

18. The solution as claimed in claim 17, wherein at least one tertiary amine containing compound in the solution is a -N(C_1-C_4 alkyl)$_3$.

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19. The solution as claimed in claim 18, wherein at least one tertiary amine containing compound in the solution is -$N(C_2$ alkyl$)_3$ (triethylamine).

20. The solution as claimed in claim 1, wherein R_1 and R_2 of Formula I are independently selected from a -C_1-C_7 alkyl.

21. The solution as claimed in claim 20, wherein R_1 and R_2 are independently selected from methyl and ethyl.

22. The solution as claimed in claim 1, wherein the at least one carbonyl compound of Formula I, forms a cyclic system selected from a 4-8 membered monocyclic ketone or a monocyclic ester.

23. The solution as claimed in claim 1, wherein each R_1 and R_2 of the at least one carbonyl compound of Formula I are further substituted with one or more substituents selected from halo, -OH, -CN, -NO_2, -C≡CH, -SH, -C_1-C_7 alkyl, -(C_1-C_7 alkyl)-OH, -NH_2, -NH(C_1-C_7 alkyl),-N(C_1-C_7 alkyl)$_2$, -O (C_1-C_7 alkyl), -C(O)-O(-C_1-C_7 alkyl), -C(O)OH; -C(O)-H, or -C(O)-(C_1-C_7 alkyl).

24. A method for separating one or more solvents from a first solution using a thermo-responsive osmotic solution as defined in claim 1, the method comprising:

1) bringing a first solution comprising one or more solvents into contact with a semi-permeable membrane;

2) allowing the one or more solvents in the first solution to flow through the semi-permeable membrane from the first solution into the thermo-responsive osmotic solution by osmosis to form a second solution comprising the thermo-responsive solution and the one or more solvents, wherein the thermo-responsive osmotic solution is at a higher osmotic concentration than the first solution;

3) raising the temperature of the second solution to or above the lower critical solution temperature of the thermo-responsive osmotic solution to cause the thermo-responsive osmotic solution in the second solution to become immiscible with the one or more solvents; and

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4) separating the one or more solvents in the second solution from the immiscible thermo-responsive osmotic solution.

25. The method as claimed in claim 24, wherein the first solution further includes one or more dissolved solutes.

26. The method as claimed in claim 24, wherein the first solution includes water as a solvent.

27. The method as claimed in claim 24, wherein the first solution is selected from seawater, brackish water, industrial water waste streams, compromised water sources, sewage, wastewater liquors, digestates, food & beverage processing effluents, grey water, fruit juices, vegetable juices, milk, produced waters, leachates, or flue gas scrubber discharge.

28. A method for separating one or more solvents from a first solution using a thermo-responsive osmotic solution as defined in claim 1, the method comprising: 1) bringing the first solution comprising the one or more solvents into contact with a semi-permeable membrane; 2) allowing the one or more solvents in the first solution to flow through the semi-permeable membrane from the first solution into the thermo-responsive osmotic solution by osmosis to form a second solution comprising the thermo-responsive osmotic solution and the one or more solvents, wherein the thermo-responsive osmotic solution is at a higher osmotic concentration than the first solution; 3) adjusting the lower critical solution temperature of the second solution to cause the thermo-responsive osmotic solution in the second solution to become immiscible with the one or more solvents; and 4) separating the one or more solvents in the second solution from the immiscible thermo-responsive osmotic solution.

29. The method as claimed in claim 28, wherein the lower critical solution temperature of the thermo-responsive osmotic solution is adjusted by adding one or more tertiary amine containing compounds as defined in claim 1.

30. The method as claimed in claim 28, wherein the lower critical solution temperature of the thermo-responsive osmotic solution is adjusted by adding one or more enolisable carbonyl compounds as defined in claim 1.

31. The method as claimed in claim 28, wherein the lower critical solution temperature of

the thermo-responsive osmotic solution is adjusted by adding one or more tertiary amine containing compounds and one or more enolisable carbonyl compounds as defined in claim 1.

32. The method as claimed in claim 28, wherein the first solution further includes one or more dissolved solutes.

33. The method as claimed in claim 28, wherein the first solution includes water as a solvent.

34. The method as claimed in claim 28, wherein the first solution is selected from seawater, brackish water, industrial water waste streams, compromised water sources, sewage, wastewater liquors, digestates, food & beverage processing effluents, grey water, fruit juices, vegetable juices, milk, produced waters, leachates, or flue gas scrubber discharge.