**CLAIMS**

1. A composition comprising from 1 to 70 weight % trifluoroiodomethane ($CF_3I$), from 1 to 40 weight % 1,1-difluoroethylene (R-1132a), and at least one additional compound of lower volatility than 1,1-difluoroethylene selected from the group consisting of 1,1,2-trifluoroethylene (R-1123), difluoromethane (R-32), propane (R-290), propylene (R-1270), fluoroethane (R-161), pentafluoroethane (R-125), 1,1,1,2-tetrafluoroethane (R-134a), 2,3,3,3-tetrafluopropene (R-1234yf), isobutane (R-600a), n-butane (R-600), trans-1,3,3,3-tetrafluopropene (R-1234ze(E)), 3,3,3-trifluoropropene (R-1243zf), 1,2,3,3,3-pentafluoropropene (R-1225ye), 1,1,1,2,3,3,3-heptafluoropropane (R-227ea), 1,1-difluoroethane (R-152a), cis-1,3,3,3-tetrafluopropene (R-1234ze(Z)), 1-chloro-3,3,3-trifluoropropene (R-1233zd(E/Z)) and 1,1,1,4,4,4-hexafluoro-2-butene (R-1336mzz(E/Z)),

wherein the composition further comprises carbon dioxide ($CO_2$; R-744).

2. The composition of claim 1 wherein the R-1132a is present in an amount of from 1 to 30 weight %, based on the total weight of the composition.

3. The composition of claim 2, wherein the R-1132a is present in an amount of from 1 to 20 weight %, based on the total weight of the composition.

4. The composition of claim 3, wherein the R-1132a is present in an amount of from 1 to 10 weight %, based on the total weight of the composition.

5. The composition of any of claims 1 to 4 wherein the $CF_3I$ is present in an amount of from 1 to 60 weight %, based on the total weight of the composition.

6. The composition of claim 5, wherein the $CF_3I$ is present in an amount of from 1 to 50 weight %, based on the total weight of composition.

7. The composition of claim 6, wherein the $CF_3I$ is present in an amount of from 1 to 40 weight %, based on the total weight of composition.

8. The composition of claim 7, wherein the $CF_3I$ is present in an amount of from 1 to 30 weight %, based on the total weight of composition.

9. The composition of claim 1 wherein the composition comprises:



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from 1 to 40 weight % R-1132a, from 1 to 50 weight % $CF_3I$, from 1 to 30 weight % R-1123 and $CO_2$;

from 1 to 40 weight % R-1132a, from 1 to 70 weight % $CF_3I$, from 1 to 50 weight % R-32 and $CO_2$;

from 1 to 40 weight % R-1132a, from 1 to 50 weight % $CF_3I$, from 1 to 20 weight %, preferably from 1 to 10 weight %, such as from 1 to 5 weight % R-290 and $CO_2$;

from 1 to 40 weight % R-1132a, from 1 to 50 weight % $CF_3I$, from 1 to 20 weight % R-125 and $CO_2$;

from 1 to 40 weight % R-1132a, from 1 to 50 weight % $CF_3I$, from 1 to 20 weight %, preferably from 1 to 10 weight %, such as from 1 to 5 weight % R-1270 and $CO_2$;

from 1 to 40 weight % R-1132a, from 1 to 50 weight % $CF_3I$, from 1 to 40 weight % R-134a and $CO_2$;

from 1 to 40 weight % R-1132a, from 1 to 50 weight % $CF_3I$, from 1 to 40 weight % R-1234yf and $CO_2$;

from 1 to 40 weight % R-1132a, from 1 to 50 weight % $CF_3I$, from 1 to 40 weight % R-1234ze(E) and $CO_2$;

from 1 to 40 weight % R-1132a, from 1 to 50 weight % $CF_3I$, from 1 to 20 weight % R-227ea and $CO_2$; or

from 1 to 40 weight % R-1132a, from 1 to 50 weight % $CF_3I$, from 1 to 40 weight % R-152a and $CO_2$.

10. The composition of any of claims 1 to 9, wherein the $CO_2$ is present in an amount of from 1 to 40 weight %, based on the total weight of the composition.

11. The composition of claim 10, wherein the $CO_2$ is present in an amount of from 1 to 30 weight %, based on the total weight of the composition.

12. The composition of claim 11, wherein the $CO_2$ is present in an amount of from 1 to 20 weight %, based on the total weight of the composition.

13. The composition of claim 12, wherein the $CO_2$ is present in an amount of from 1 to 10 weight %, based on the total weight of the composition.

14. The composition of claim 1 wherein the composition comprises:

from 1 to 40 weight % R-1132a, from 1 to 50 weight % $CF_3I$, and from 1 to 40 weight % $CO_2$;

from 1 to 40 weight % R-1132a, from 1 to 50 weight % $CF_3I$, from 1 to 40 weight % R-1123 and from 1 to 40 weight % $CO_2$;



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from 1 to 40 weight % R-1132a, from 1 to 70 weight % $CF_3I$, from 1 to 50 weight % R-32 and from 1 to 40 weight % $CO_2$;

from 1 to 40 weight % R-1132a, from 1 to 50 weight % $CF_3I$, from 1 to 20 weight %, preferably from 1 to 10 weight %, such as from 1 to 5 weight % R-290 and from 1 to 40 weight % $CO_2$;

from 1 to 40 weight % R-1132a, from 1 to 50 weight % $CF_3I$, from 1 to 20 weight % R-125 and from 1 to 40 weight % $CO_2$;

from 1 to 40 weight % R-1132a, from 1 to 50 weight % $CF_3I$, from 1 to 20 weight %, preferably from 1 to 10 weight %, such as from 1 to 5 weight % R-1270 and from 1 to 40 weight % $CO_2$;

from 1 to 40 weight % R-1132a, from 1 to 50 weight % $CF_3I$, from 1 to 40 weight % R-134a and from 1 to 40 weight % $CO_2$;

from 1 to 40 weight % R-1132a, from 1 to 50 weight % $CF_3I$, from 1 to 50 weight % R-1234yf and from 1 to 40 weight % $CO_2$;

from 1 to 40 weight % R-1132a, from 1 to 50 weight % $CF_3I$, from 1 to 20 weight % R-227ea and from 1 to 40 weight % $CO_2$;

from 1 to 40 weight % R-1132a, from 1 to 50 weight % $CF_3I$, from 1 to 50 weight % R-152a and from 1 to 40 weight % $CO_2$;

from 1 to 40 weight % R-1132a, from 1 to 40 weight % $CF_3I$, from 1 to 40 weight % R-32 and from 1 to 20 weight % $CO_2$ and from 1 to 40 weight % R-1234yf;

from 1 to 40 weight % R-1132a, from 1 to 40 weight % $CF_3I$, from 1 to 40 weight % R-32 and from 1 to 20 weight % $CO_2$ and from 1 to 40 weight % R-1234ze(E); or

from 1 to 40 weight % R-1132a, from 1 to 40 weight % $CF_3I$, from 1 to 40 weight % R-32 and from 1 to 20 weight % $CO_2$ and from 1 to 40 weight % R-152a.

15. The composition of any one of the preceding claims further comprising a stabilizer, preferably wherein the stabiliser is selected from the group consisting of diene-based compounds, phosphates, phenol compounds and epoxides, and mixtures thereof.

16. A composition of any one of the preceding claims consisting essentially of the stated components.

17. A composition of any one of the preceding claims, wherein the refrigerant composition is less flammable than R-1132a alone, preferably wherein the refrigerant composition has:

a. a higher flammable limit’
b. a higher ignition energy; and/or
c. a lower flame velocity



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compared to R-1132a alone.

18. A composition of any one of the preceding claims wherein the composition is non-flammable, preferably wherein the refrigerant composition is non-flammable at ambient temperature, or wherein the composition is non-flammable at 60 °C.

19. The composition of any one of the preceding claims which has a Global Warming Potential (GWP) below 150.

20. The composition of any one of the preceding claims wherein the refrigerant composition has a temperature glide in an evaporator or condenser of less than about 10K.

21. The composition of claim 20, wherein the refrigerant composition has a temperature glide in an evaporator or condenser of less than about 5K.

22. The use of a composition as claimed in any one of the preceding claims as a refrigerant in a vapour compression heat transfer system.

23. A vapour compression heat transfer system comprising a composition as claimed in any one of claims 1 to 21.

24. The vapour compression heat transfer system of claim 23 which further comprises a lubricant.

25. The vapour compression heat transfer system of claim 24, wherein the lubricant is a polyolester (POE) or polyalkylene glycol (PAG) lubricant.

26. A method of producing cooling which comprises evaporating a composition as claimed in any one of claims 1 to 21 in the vicinity of a body to be cooled.

27. A method of producing heating which comprises condensing a refrigerant composition as claimed in any one of claims 1 to 21 in the vicinity of a body to be heated.

28. A sprayable composition comprising material to be sprayed and a propellant comprising a composition as defined in any of claims 1 to 21.



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29. A method for extracting a substance from biomass comprising contacting biomass with a solvent comprising a composition as defined in any of claims 1 to 21 and separating the substance from the solvent.

30. A method of cleaning an article comprising contacting the article with a solvent comprising a composition as defined in any of claims 1 to 21.

31. A method of extracting a material from an aqueous solution or from a particulate solid matrix comprising contacting the aqueous solution or the particulate solid matrix with a solvent comprising a composition as defined in any of claims 1 to 21 and separating the material from the solvent.

32. A mechanical power generation device containing a composition as defined in any of claims 1 to 21.

33. A mechanical power generating device according to claim 32 which is adapted to use a Rankine Cycle or modification thereof to generate work from heat.

34. A method of retrofitting a heat transfer device comprising the step of removing an existing heat transfer composition, and introducing a composition as defined in any one of claims 1 to 21.

35. A method of claim 34 wherein the heat transfer device is a commercial or industrial refrigeration device, a heat pump, or a residential or commercial air conditioning system.

36. A method for reducing the environmental impact arising from the operation of a product comprising an existing compound or composition, the method comprising replacing at least partially the existing compound or composition with a composition as defined in any one of claims 1 to 21.

37. A method of claim 36 wherein the use of the composition of the invention results in a lower Total Equivalent Warming Impact, and/or a lower Life-Cycle Carbon Production than is attained by use of the existing compound or composition.

38. A method of claim 36 or 37 carried out on a product from the fields of air-conditioning, refrigeration, heat transfer, aerosols or sprayable propellants, gaseous dielectrics, flame suppression, solvents, cleaners, topical anaesthetics, and expansion applications.



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39. A method according to claim 36 or 37 wherein the product is selected from a heat transfer device, a sprayable composition, a solvent or a mechanical power generation device, preferably a heat transfer device.

40. A method according to claim 39 wherein the product is a heat transfer device, preferably a residential or commercial air conditioning system, a heat pump or a commercial or industrial refrigeration system.

41. A method according to any of claims 34 to 40 wherein the existing compound or composition is a heat transfer composition.

42. A method according to claim 41, wherein the heat transfer composition is a refrigerant selected from R-410A, R-454B, R-452B and R-32



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