

## Claims

1. A composition comprising:
  - (i) from 2 to 50% by weight 1,1-difluoroethene (vinylidene fluoride, R-1132a);
  - 5 (ii) from 2 to ~~less than 98.95%~~ 95% by weight difluoromethane (R-32); and
  - (iii) 2,3,3,3-tetrafluoropropene (R-1234yf).
2. A composition according to claim 1 comprising from 2 to 40% by weight R-1132a.
- 10 3. A composition according to claim 1 or 2 comprising from 2 to 30% by weight R-1132a.
4. A composition according to any of the preceding claims comprising from 3 to 20% by weight R-1132a.
- 15 5. A composition according to any of the preceding claims comprising from 5 to 20% by weight R-1132a.
6. A composition according to any of the preceding claims comprising from 5 to 90% by weight R-32.
- 20 7. A composition according to claim 6 comprising from 10 to 80% by weight R-32.
8. A composition according to claim 7 comprising from 15 to 70% by weight R-32.
- 25 9. A composition according to any of the preceding claims comprising from 5 to 90% by weight R-1234yf.
10. A composition according to claim 9 comprising from 7 to 85% by weight R-1234yf.
- 30 11. A composition according to claims 9 or 10 comprising from 8 to 80% by weight R-1234yf.
12. A composition according to claim 11 comprising from 10 to 75% by weight R-1234yf.
- 35 13. A composition according to claim 12 comprising from 10 to 65% by weight R-1234yf.

14. A composition according to claim 1 comprising from 2 to 40% by weight R-1132a, from 4 to 94% by weight R-32, and from 4 to 94% by weight R-1234yf.
- 5 15. A composition according to claim 14 comprising from 3 to 30% by weight R-1132a, from 10 to 91% by weight R-32 and from 6 to 87% by weight R-1234yf.
16. A composition according to claim 15 comprising from 4 to 25% by weight R-1132a, from 15 to 88% by weight R-32 and from 8 to 81% by weight R-1234yf.
- 10 17. A composition according to any of the preceding claims further comprising carbon dioxide (CO<sub>2</sub>, R-744), optionally wherein the CO<sub>2</sub> is present in an amount of from 1 to 30% by weight.
- 15 18. A composition according to claim 17, wherein the CO<sub>2</sub> is present in an amount of from 2 to 20% by weight.
19. A composition according to claims 17 or 18, wherein the R-1132a and CO<sub>2</sub> are present in a combined amount of from 4 to 30% by weight.
- 20 20. A composition according to claims 17-19, wherein the R-1132a and CO<sub>2</sub> are present in a combined amount of from 5 to 20% by weight.
21. A composition according to any of the preceding claims further comprising 1,1,2-trifluoroethene (R-1123).
- 25 22. A composition according to claim 21, wherein R-1123 is present in an amount of from 5 to 20% by weight.
- 30 23. A composition according to any of claims 1 to 20, wherein the composition contains less than about 8% by weight 1,1,2-trifluoroethene (R-1123).
24. A composition according to claim 23, wherein the composition contains less than about 1% by weight 1,1,2-trifluoroethene (R-1123).
- 35 25. A composition according to claim 24, wherein the composition is substantially free of 1,1,2-trifluoroethene (R-1123).

26. A composition according to claim 25, wherein the composition contains no 1,1,2-trifluoroethene (R-1123).
27. A composition according to any of the preceding claims consisting essentially of  
5 the stated components.
28. A composition according to any of the preceding claims, wherein the composition is less flammable than R-1132a alone.
- 10 29. A composition according to claim 28 wherein the composition has:  
a. a higher flammable limit  
b. a higher ignition energy; and/or  
c. a lower flame velocity  
compared to R-1132a alone.
- 15 30. A composition according to any of the preceding claims wherein the composition is non-flammable.
31. A composition according to claim 30 wherein the composition is non-flammable at  
20 ambient temperature, preferably wherein the composition is non-flammable at 60 °C.
32. A composition according to any of the preceding claims wherein the composition has a volumetric refrigeration capacity that is at least 90% of that of R-410A.
- 25 33. A composition according to any of the preceding claims wherein the composition has a coefficient of performance (COP) that is equivalent or higher to that of R-410A.
34. A composition according to any of the preceding claims wherein the composition has an operating pressure in a condenser equal to or lower than that of R-32.
- 30 35. A composition according to any of the preceding claims wherein the composition has a compressor discharge temperature that is lower than that of R-32.
36. A composition according to any of the preceding claims wherein the composition  
35 has a temperature glide in an evaporator or condenser of less than about 10K.

37. A composition according to claim 36, wherein the composition has a temperature glide in an evaporator condenser of less than about 5K.
38. A composition according to any of the preceding claims wherein the composition  
5 has a burning velocity of less than about 10 cm/s as measured by ASHRAE Standard 34.
39. A composition comprising a lubricant and a composition according to any of the preceding claims.
- 10 40. A composition according to claim 39, wherein the lubricant is selected from mineral oil, silicone oil, polyalkyl benzenes (PABs), polyol esters (POEs), polyalkylene glycols (PAGs), polyalkylene glycol esters (PAG esters), polyvinyl ethers (PVEs), poly (alpha-olefins) and combinations thereof.
- 15 41. A composition according to claims 39 or 40, wherein the lubricant is selected from PAGs or POEs.
42. A composition comprising a stabiliser and a composition according to any of the preceding claims.
- 20 43. A composition according to claim 42, wherein the stabiliser is selected from diene-based compounds, phosphates, phenol compounds and epoxides, and mixtures thereof.
44. A composition comprising a flame retardant and a composition according to any of  
25 the preceding claims.
45. A composition according to claim 44, wherein the flame retardant is selected from the group consisting of tri-(2-chloroethyl)-phosphate, (chloropropyl) phosphate, tri-(2,3-dibromopropyl)-phosphate, tri-(1,3-dichloropropyl)-phosphate, diammonium phosphate,  
30 various halogenated aromatic compounds, antimony oxide, aluminium trihydrate, polyvinyl chloride, a fluorinated iodocarbon, a fluorinated bromocarbon, trifluoro iodomethane, perfluoroalkyl amines, bromo-fluoroalkyl amines and mixtures thereof.
46. A heat transfer device containing a composition as defined in any one of claims  
35 1 to 45.

47. A heat transfer device according to claim 46 wherein the heat transfer device is a refrigeration device.
48. A heat transfer device according to claim 46 or 47 wherein the heat transfer device  
5 comprises a residential or commercial air conditioning system, a heat pump or a commercial or industrial refrigeration system.
49. Use of a composition as defined in any one of claims 1 to 45 in a heat transfer device.
- 10 50. The use according to claim 49, wherein the heat transfer device is a refrigeration device.
51. A sprayable composition comprising material to be sprayed and a propellant comprising a composition as defined in any of claims 1 to 45.
- 15 52. A method for cooling an article which comprises condensing a composition defined in any of claims 1 to 45 and thereafter evaporating the composition in the vicinity of the article to be cooled.
- 20 53. A method for heating an article which comprises condensing a composition as defined in any one of claims 1 to 45 in the vicinity of the article to be heated and thereafter evaporating the composition.
54. A method for extracting a substance from biomass comprising contacting biomass  
25 with a solvent comprising a composition as defined in any of claims 1 to 45 and separating the substance from the solvent.
55. A method of cleaning an article comprising contacting the article with a solvent comprising a composition as defined in any of claims 1 to 45.
- 30 56. 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 45 and separating the material from the solvent.
- 35 57. A mechanical power generation device containing a composition as defined in any of claims 1 to 45.

58. A mechanical power generating device according to claim 57 which is adapted to use a Rankine Cycle or modification thereof to generate work from heat.
- 5 59. 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 45.
60. A method of claim 59 wherein the heat transfer device is a commercial or industrial  
10 refrigeration device, a heat pump, or a residential or commercial air conditioning system.
61. 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  
15 defined in any one of claims 1 to 45.
62. A method of claim 61 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.  
20
63. A method of claim 61 or 62 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 anesthetics, and expansion applications.
- 25 64. A method according to claim 61 or 62 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.
65. A method according to claim 64 wherein the product is a heat transfer device,  
30 preferably a residential or commercial air conditioning system, a heat pump or a commercial or industrial refrigeration system.
66. A method according to any of claims 59 to 65 wherein the existing compound or composition is a heat transfer composition, preferably wherein the heat transfer  
35 composition is a refrigerant selected from R-410A, R-454B, R-452B and R-32.