TITLE

COMPOSITIONS COMPRISING 2,3-DICHLORO-1,1,1-TRIFLUOROPROPANE, 2-CHLORO-1,1,1-TRIFLUOROPROPENE, 2-CHLORO-1,1,1,2-TETRAFLUOROPROPANE OR 2,3,3,3-TETRAFLUOROPROPENE

BACKGROUND

1. Field of the Invention.

The present disclosure relates to the field of compositions which may be useful as heat transfer compositions, aerosol propellants, foaming agents, blowing agents, solvents, cleaning agents, carrier fluids, displacement drying agents, buffing abrasion agents, polymerization media, expansion agents for polyolefins and polyurethane, gaseous dielectrics, extinguishing agents, and fire suppression agents in liquid or gaseous form. In particular, the present disclosure relates to compositions which may be useful as heat transfer compositions, such as 2,3,3,3,-tetrafluoropropene (HFO-1234yf, or 1234yf) or compositions comprising 2,3-dichloro-1,1,1-trifluoropropane (HCFC-243db or 243db), 2-chloro-1,1,1-trifluoropropene (HCFO-1233xf or 1233xf) or 2-chloro-1,1,1,2-tetrafluoropropane (HCFC-244bb).

2. Description of Related Art.

New environmental regulations have led to the need for new compositions for use in refrigeration, air-conditioning and heat pump apparatus. Low global warming potential compounds are of particular interest.

SUMMARY

Applicants have found that in preparing such new low global warming potential compounds, such as 1234yf, that certain additional compounds are present in small amounts.

In one aspect, there is provided a composition comprising HFO-1234yf, HFO-1243zf, and at least one additional compound selected from the group consisting of HFO-1234ze, HCFC-243db, HCFC-244db, HFC-245cb, HFC-245fa, HCFO-1233xf, HCFO-1233zd, HCFC-253fb, HCFC-234ab, HCFC-243fa, ethylene, HFC-23, CFC-13, HFC-143a, HFC-152a, HFC-236fa, HCO-1130, HCO-1130a, HFO-1336, HCFC-133a, HCFC-254fb, HCFC-1131, HFO-1141, HCFO-1242zf, HCFO-1223xd, HCFC-233ab, HCFC-226ba, and HFC-227ca.

In another aspect, there is provided a use of the compositions described herein as refrigerants.

In another aspect, there is provided a use of the compositions described herein as a refrigerant in air conditioners, freezers, refrigerators, heat pumps, water chillers, flooded evaporator chillers, direct expansion chillers, centrifugal chillers, walk-in coolers, heat pumps, mobile refrigerators, mobile air conditioning units and combinations thereof.

In another aspect, there is provided a use of the compositions described herein as aerosol propellants.

In another aspect, there is provided a use of the compositions described herein as foaming agents.

In another aspect, there is provided a method of using the compositions described herein comprising the composition carrying heat from a heat source to a heat sink.

In another aspect, there is provided a method of using the compositions described herein as a refrigerant in a cycle comprising the composition undergoing a phase change from a liquid to a gas and back.

Therefore, in accordance with the present disclosure, there is provided a composition comprising HFO-1234yf and at least one

additional compound selected from the group consisting of HFO-1234ze, HFO-1243zf, HCFC-243db, HCFC-244db, HFC-245cb, HFC-245fa, HCFO-1233xf, HCFO-1233zd, HCFC-253fb, HCFC-234ab, HCFC-243fa, ethylene, HFC-23, CFC-13, HFC-143a, HFC-152a, HFO-1243zf, HFC-236fa, HCO-1130, HCO-1130a, HFO-1336, HCFC-133a, HCFC-254fb, HCFC-1131, HFC-1141, HCFO-1242zf, HCFO-1223xd, HCFC-233ab, HCFC-226ba, and HFC-227ca. The composition contains less than about 1 weight percent of the at least one additional compound.

Compositions comprising HCFC-243db, HCFO-1233xf, and/or HCFC-244db are useful in processes to make HFO-1234yf. Therefore, compositions comprising 1234yf may contain some amount of HCFC-243db, HCFO-1233xf, and/or HCFC-244db, in addition to other compounds.

Therefore, in accordance with the present disclosure, there is provided a composition comprising HCFC-243db and at least one additional compound selected from the group consisting of ethylene, HFC-23, CFC-13, HFC-143a, HFC-152a, HFO-1234yf, HFO-1243zf, HFC-236fa, HCO-1130, HCO-1130a, HFO-1234ze, HFO-1336, HCFC-244bb, HCFC-244db, HFC-245fa, HFC-245cb, HCFC-133a, HCFC-254fb, HCFC-1131, HCFO-1233xf, HCFO-1233zd, HCFO-1242zf, HCFC-253fb, HCFO-1223xd, HCFC-233ab, HCFC-226ba, and HFC-227ca. The composition may contain anywhere from greater than zero weight percent to about 99 weight percent of HCFC-243db.

In addition, in accordance with the present disclosure, there is further provided a composition comprising HCFO-1233xf and at least one additional compound selected from the group consisting of HCFO-1233zd, HCFO-1232xd, HCFO-1223xd, HCFC-253fb, HCFC-233ab, HFO-1234yf, HFO-1234ze, ethylene, HFC-23, CFC-13, HFC-143a, HFC-152a, HFO-1243zf, HFC-236fa, HCO-1130, HCO-1130a, HFO-1336, HCFC-244bb, HCFC-244db, HFC-245fa, HFC-245cb, HCFC-133a, HCFC-254fb, HCFC-1131, HCFO-1242zf, HCFO-1223xd, HCFC-233ab, HCFC-226ba, and HFC-227ca. The composition may contain anywhere from greater than zero weight percent to about 99 weight percent of HCFO-1233xf.

In addition, in accordance with the present disclosure, there is also provided a composition comprising HCFC-244bb and at least one additional compound selected from the group consisting of HCFO-1233zd, HCFO-1232xd, HCFO-1223xd, HCFC-253fb, HCFC-233ab, HFO-1234yf, HFO-1234ze, ethylene, HFC-23, CFC-13, HFC-143a, HFC-152a, HFO-1243zf, HFC-236fa, HCO-1130, HCO-1130a, HFO-1336, HCFC-244db, HFC-245fa, HFC-245cb, HFC-245eb, HCFC-133a, HCFC-254fb, HCFC-1131, HCFO-1242zf, HCFO-1223xd, HCFC-233ab, HCFC-226ba, and HFC-227ca. The composition may contain anywhere from greater than zero weight percent to about 99 weight percent of HCFC-244bb.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic drawing showing a reaction for producing HFO-1234yf from 243db.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

HFO-1234yf has been suggested for use as a refrigerant, heat transfer fluid, aerosol propellant, foam expansion agent, among other uses. It has also, advantageously, been found that HFO-1234yf has a low global warming potential (GWP) as reported by V.C. Papadimitriou, et al. in Physical Chemistry Chemical Physics, 2007, volume 9, pages 1-13. Thus, HFO-1234yf is a good candidate for replacing the higher GWP saturated HFC refrigerants.

In one embodiment, the present disclosure provides a composition comprising HFO-1234yf and at least one additional compound selected from the group consisting of HFO-1234ze, HFO-1243zf, HCFC-243db, HCFC-244db, HFC-245cb, HFC-245fa, HCFO-1233xf, HCFO-1233zd, HCFC-253fb, HCFC-234ab, HCFC-243fa, ethylene, HFC-23, CFC-13, HFC-143a, HFC-152a, HFC-236fa, HCO-1130, HCO-1130a, HFO-1336, HCFC-133a, HCFC-254fb, HCFC-1131, HFO-1141, HCFO-1242zf, HCFO-1223xd, HCFC-233ab, HCFC-226ba, HFC-227ca.

CLAIMS

What is claimed is:

1. A composition comprising HFO-1234yf, HFO-1243zf, and at least one additional compound selected from the group consisting of HFO-1234ze, HCFC-243db, HCFC-244db, HFC-245cb, HFC-245fa, HCFO-1233xf, HCFO-1233zd, HCFC-253fb, HCFC-234ab, HCFC-243fa, ethylene, HFC-23, CFC-13, HFC-143a, HFC-152a, HFC-236fa, HCO-1130, HCO-1130a, HFO-1336, HCFC-133a, HCFC-254fb, HCFC-1131, HFO-1141, HCFO-1242zf, HCFO-1223xd, HCFC-233ab, HCFC-226ba, and HFC-227ca.

2. The composition of claim 1 containing less than about 1 weight percent of the at least one additional compound.

3. Use of the compositions of claim 1 as refrigerants.

4. Use of the compositions of claim 1 as a refrigerant in air conditioners, freezers, refrigerators, heat pumps, water chillers, flooded evaporator chillers, direct expansion chillers, centrifugal chillers, walk-in coolers, heat pumps, mobile refrigerators, mobile air conditioning units and combinations thereof.

5. Use of the compositions of claim 1 as aerosol propellants.

6. Use of the compositions of claim 1 as foaming agents.

7. A method of using the compositions of claim 1 comprising the composition carrying heat from a heat source to a heat sink.

8. A method of using the composition of claim 1 as a refrigerant in a cycle comprising the composition undergoing a phase change from a liquid to a gas and back.