their widespread use may also be limited in the future. Thus, there is a need for compositions that do not contribute to the destruction of stratospheric ozone and also have low global warming potentials (GWPs). Certain hydrofluoroolefins, such as 1,1,1,4,4,4-hexafluoro-2-butene ($CF_3CH=CHCF_3$, FC-1336mzz), are believed to meet both goals.

SUMMARY OF THE INVENTION

This application includes eight different types of azeotropic or azeotrope-like mixtures.

In one aspect, there is provided an azeotropic composition consisting essentially of: (a) Z-1,1,1,4,4,4-hexafluoro-2-butene; and (b) pentane; wherein the pentane is present in an effective amount to form an azeotropic combination with the Z-1,1,1,4,4,4-hexafluoro-2-butene, and wherein said composition consists essentially of from about 48.2 mole percent to about 58.7 mole percent Z-1,1,1,4,4,4-hexafluoro-2-butene and from about 51.8 mole percent to about 41.3 mole percent pentane, which has boiling point temperature of from about -20 °C to about 120 °C at a pressure of from about 2.2 psia (15 kPa) to about 182 psia (1250 kPa).

In another aspect, there is provided an azeotrope-like composition consisting essentially of: (a) Z-1,1,1,4,4,4-hexafluoro-2-butene; and (b) pentane; wherein the pentane is present in an effective amount to form an azeotrope-like combination with the Z-1,1,1,4,4,4-hexafluoro-2-butene, and wherein said azeotrope-like composition consists essentially of from 45 to 99 weight percent Z-1,1,1,4,4,4-hexafluoro-2-butene and from 55 to 1 weight percent pentane, and characterized by: at a temperature of from -40 °C to 120 °C, said composition having a difference in dew point pressure and bubble point pressure of less than or equal to 5 percent based upon the bubble point pressure.

This disclosure provides a composition consisting essentially of (a) Z-FC-1336mzz and (b) methyl formate; wherein the methyl formate is present in an effective amount to form an azeotropic or azeotrope-like mixture with Z-FC-1336mzz.

This disclosure also provides a composition consisting essentially of (a) Z-FC-1336mzz and (b) pentane; wherein the pentane is present in an effective amount to form an azeotropic or azeotrope-like mixture with Z-FC-1336mzz.

This disclosure also provides a composition consisting essentially of (a) Z-FC-1336mzz and (b) 2-methylbutane (isopentane); wherein the isopentane is present in an effective amount to form an azeotropic or azeotrope-like mixture with Z-FC-1336mzz.

This disclosure also provides a composition consisting essentially of (a) Z-FC-1336mzz and (b) 1,1,1,3,3-pentafluorobutane ($CF_3CH_2CF_2CH_3$, HFC-365mfc); wherein the HFC-365mfc is present in an effective amount to form an azeotrope-like mixture with Z-FC-1336mzz.

This disclosure also provides a composition consisting essentially of (a) Z-FC-1336mzz and (b) trans-1,2-dichloroethylene; wherein the trans-1,2-dichloroethylene is present in an effective amount to form an azeotropic or azeotrope-like mixture with Z-FC-1336mzz.

This disclosure also provides a composition consisting essentially of (a) Z-FC-1336mzz and (b) 1,1,1,3,3-pentafluoropropane ($CF_3CH_2CF_2H$,