CLAIMS

What is claimed is:

1. A method of producing 1,1-difluoropropene (HFO-1252zc, CF_2=$CHCH_3$), the method comprising:
    a. contacting a (halo)olefin comprising one of 3,3,3-trifluoropropene (HFO-1243zf, CF_3CH=CH_2), 3-chloro-3,3-difluoropropene (HCFO-1242zf, $CClF_2CH$=CH_2), or 2,3-dichloro-3,3-difluoropropene (HCFO-1232xf, $CClF_2CCl$=CH_2) with hydrogen to form a first product mixture comprising a compound defined by the formula $CF_2XCH_2CH_3$, wherein X is one of Cl, F, Br, or I; and
    b. dehydrohalogenating the $CF_2XCH_2CH_3$ compound of the first product mixture to form a second product mixture comprising HFO-1252zc.
2. The method of claim 1, wherein the dehydrohalogenation is conducted in the vapor phase in the presence or absence of a catalyst or metal alloy packing material.
3. The method of claim 1 or claim 2, wherein the dehydrohalogenation is conducted in the presence of a catalyst comprising a supported or unsupported partially fluorinated transition metal oxide, nickel-based alloy or nickel-chromium-based alloy.
4. The method of claim 1 or claim 2, wherein the dehydrohalogenation is conducted by thermal pyrolysis in the absence of a catalyst.
5. The method of claim 1, wherein the dehydrohalogenation is conducted in the liquid phase.
6. The method of claim1 or claim 5, wherein the dehydrohalogenation is conducted in the presence of a strong base, optionally (1) in the presence or absence of a catalyst, and (2) in the presence or absence of an aprotic solvent.
7. The method of claim 6, wherein the base comprises potassium t-butoxide ($(CH_3)_3COK$, KOtBu).

8. The method of claim 6 or claim 7, wherein a solvent is present and comprises one of dimethylformamide (DMF), dimethylacetamide (DMAc), dimethyl sulfoxide (DMSO), methyl pyrrolidine (MP) or tert-butyl alcohol, optionally in the presence of a catalyst.

9. The method of claim 7 or claim 8, wherein KOtBu is continuously added to the mixture to be dehydrohalogenated and/or HFO-1252zc is continuously removed.

10. The method of claim 1, wherein the $CF_2XCH_2CH_3$ compound is HCFC-262fc and is dehydrochlorinated to HFO-1252zc.

11. The method of claim 10, wherein the dehydrochlorination of HCFC-262fc to form HFO-1252zc is conducted in the vapor phase by pyrolysis

12. The method of claim 10, wherein the dehydrochlorination of HCFC-262fc to form HFO-1252zc is conducted in the temperature range of about 450°C to about 550°C.

13. The method of any one of claims 10 to 12, wherein the dehydrochlorination of HCFC-262fc to form HFO-1252zc is conducted in the pressure range of about 0 to about 150 psig.

14. The method of claim 1, wherein the hydrogenation is conducted in the liquid or vapor phase.

15. The method of claim 1, wherein the hydrogenation is conducted in the presence of a catalyst comprising Pd carried on one of aluminum oxide, aluminum fluoride or carbon.

16. The method of claim 1, further comprising separating the $CF_2XCH_2CH_3$ compound from the first product mixture produced by step (a) prior to dehydrohalogenation of the $CF_2XCH_2CH_3$ compound in step (b).

17. A composition comprising 1,1-difluoropropene (HFO-1252zc) and one or more additional compounds selected from the group consisting of trifluoromethane (HFC-23), dichloromethane (HCC-30), chlorofluoromethane (HCFC-31), difluoromethane (HFC-32), ethylene, ethane, chlorodifluoromethane (HCFC-22), methyl chloride (HCC-40), dichloromethane (HCC-30), methane, 1,1,2,2,2-

pentafluoroenthane (HFC-125), 1,1,2-trifluoroethane (HFC-143), 1,1,1-trifluoroethane (HFC-143a), 1,1-difluoroethane (HFC-152a), 1,1,1,2,2-pentafluoropropane (HFC-245cb), 2-chloro-1,1,1-trifluoropropane (HCFC-253db), 1,1,1,3-tetrafluoropropane (HFC-254fb), 1,1,1-trichloropropane (HCC-260fb), 1,1-dichloro-1-fluoropropane (HCFC-261fc), 1,1-difluoropropane (HFC-272fb), propane (HC-290), tetrafluorobutene (HFO-374), butane (HC-600), allene, 2-butene, cyclobutene, 2-methylpropene, 1-chloro-2,2-difluoroethylene (HCFO-1122), 1,2-difluoroethene (HFO-1132), 1,1-difluorothene (HFO-1132a), fluoroethene (HFO-1141), ethylene (HO-1150), 1,1,2-trichloro-3,3,3-trifluoropropene (CFO-1213xa), 2-chloro-3,3,3-trifluoropropene (HCFO-1233xf), 2,3,3,3-tetrafluoropropene (HFO-1234yf), 3-chloro-3,3-difluoropropene (HCFO-1242zf), 3,3,3-trifluoropropene (HFO-1243zf), E-1-chloro-1-fluoro-1-propene (E-HCFO-1251zb), Z-1-chloro-1-fluoro-1-propene (Z-HCFO-1251zb), 3-chloropropene (HCO-1260zf), 3-fluoro-1-propene (HFO-1261zf), E-1-fluoro-1-propene (E-HFO-1261ze), 1-fluoropropane (HFC-281fa), 1,1-difluoropropane (272fb), tetrafluorobutane (C4H6F4), 1252-dimers (C6F4H8), propylene (HO-1270), pentafluorobutene (HFO-1345), and E/Z-t-BuO-CF=CH-CH_3, 1,1,1-trifluoropropane (HFC-263fb), and 1-chloro-1,1,-difluoropropane (HCFC-262fc).

18. The composition of claim 17 comprising 1,1-difluoropropene (HFO-1252zc) and one or more members additional compounds from the group consisting of ethylene (HO-1150), trifluoromethane (HFC-23),1,1-difluoroethylene (HCO-1132a), fluoroethane (HFC-1141), 1,1,2,2,2-pentafluoroenthane (HFC-125), propane (HC-290), 1,1,2-trifluoroethane (HFC-143), 1,1-difluoropropene (HFO-1252zc), HFO-1234, 1,1,difluoroethane (HFC-152a), 3-fluoro-1-propene (HFO-1261), 1,1,1-trifluoropropane (HCC-263fb), 1,1,1-trichloroethane (HCC-143a), 3-fluoro-1-propene (HFO-1261), HFO-1252, chloro-3,3,3-trifluoropropene (HCFO-1233), and pentafluorobutene (HFO-374).

19. The composition of claim 17 comprising 1,1-difluoropropene (HFO-1252zc) and one or more additional compounds selected from the group consisting of ethylene, HFC-23, HFO-1132a, propane, HFO-1234yf, E-HFO-1261ze, HFC-263fb, HFC-143a and HFO-1252 isomers.

20. The composition of claim 19 comprising 1,1-difluoropropene (HFO-1252zc), E-HFO-1261ze, and HFC-263fb.