CLAIMS

What is claimed is:

1. A process comprising contacting (1) 2,3-dichloro-3,3-difluoropropene (HCFO-1232xf) or (2) a mixture of co-produced HCFO-1232xf and 2-chloro-3,3,3-trifluoropropene (HCFO-1233xf) with hydrogen in the presence of a catalyst to produce a reaction mixture comprising 1,2-dichloro-1,1-difluoropropane (HCFC-252dc).

2. The process of claim 1, the process further comprising making the HCFO-1232xf or the co-produced HCFO-1232xf and HCFO-1233xf by contacting 1,1,2,3-tetrachloro-1-propene (HCO-1230xa) and HF in the absence or presence of a catalyst.

3. The process of claim 1, wherein the reaction mixture further comprises 2-chloro-1,1,1-trifluoropropane (HCFC-253db).

4. The process of claim 1 or claim 3, wherein the process is in the vapor phase.

5. The process of claim 4,

wherein a molar ratio of H_2 to HCFO-1232xf is from about 1:1 to about 15:1, preferably from about 1.5:1 to about 10:1; or

wherein the contacting is at a temperature of between about 20°C and about 200°C; or

wherein the catalyst comprises a transition metal.

6. The process of claim 4 or claim 5,

wherein the catalyst is selected from the group consisting of Cu, Ni, Pd, Pd and combinations thereof; or

wherein the catalyst is Pd/C; or

wherein the catalyst is Pd/Al_2O_3.

7. The process of claim 6, wherein the catalyst loading is in the range of 0.005 wt.% to 3 wt.%.

8. The process of claim 1 or claim 3, wherein the process is in the liquid phase.

9. The process of claim 8,

wherein a molar ratio of H_2 to HCFO-1232xf is from about 1:1 to about 5:1, preferably from about 1.2:1 to about 3:1; or

wherein the contacting is at a temperature of between about 20°C and about 150°C; or

wherein the catalyst comprises a transition metal.

10. The process of claim 8 or claim 9, wherein the catalyst is selected from the group consisting of Cu, Ni, Pd, Pd and combinations thereof.

11. The process of claim 10, wherein the catalyst loading is in the range of 0.005 wt.% to 3 wt.%.

12. The process of any one of claims 8 to 11, wherein the process is conducted in the presence of a solvent.

13. The process of claim 12, wherein the solvent is a protic or aprotic organic solvent.

14. The process of claim 13, wherein the solvent is selected from the group consisting of an alcohol, dimethyl sulfoxide (DMSO), dimethyl acetamide (DMAC), dimethyl formamide (DMF), tetrahydrofuran (THF) and dioxan.

15. A process of making 1,2-dichloro-1,1-difluoropropane (HCFC-252dc) comprising:

a. contacting 2-chloro-3,3,3-trifluoropropene (HCFO-1233xf) and hydrogen chloride in the presence of a catalyst to form 2,3-dichloro-3,3-difluoropropene (HCFO-1232xf), and

b. contacting the HCFO-1232xf and hydrogen in the presence of another catalyst to make HCFC-252dc.

16. A process of making 1,1-difluoropropene (HFO-1252zc) comprising contacting the HCFC-252dc produced by the process of claim 15 with hydrogen in the vapor phase in the presence of a catalyst.

17. A process of making 1,1-difluoropropene (HFO-1252zc) comprising contacting 1,2-dichloro-1,1-difluoropropane (HCFC-252dc) with hydrogen in the vapor

phase in the presence of a catalyst, wherein the catalyst comprises a metal selected from the group consisting of Cu, Au, and combinations thereof.

18. The process of claim 17,

wherein the metal catalyst is supported on one of carbon, silicon carbide and Al_2O_3; or

wherein the catalyst loading ranges from about 0.1% to about 10%.

19. The process of claim 17 or claim 18, wherein the reaction temperature is in the range of about 160°C to about 500°C, preferably about 250°C to about 450°C.

20. A process of making 1,1-difluoropropene (HFO-1252zc) comprising contacting 1,2-dichloro-1,1-difluoropropane (HCFC-252dc) with a metal, in the liquid phase in the presence of a catalyst.

21. The process of claim 20, wherein the metal is a reactive metal.

22. The process of claim 20 or claim 21, wherein the metal is selected from the group consisting of Zn, Mg, Cu, Fe and combinations thereof.

23. The process of any one of claims 20 to 22, wherein the reaction is conducted in the presence of a protic or aprotic solvent, acetic acid or acetic anhydride.

24. The process of claim 23, wherein the solvent is selected from the group consisting of an alcohol, or one of dimethyl sulfoxide (DMSO), dimethyl acetamide (DMAC), dimethyl formamide (DMF), tetrahydrofuran (THF), pyridine and dioxane.

25. The process of claim 24, wherein the alcohol is selected from the group consisting of methanol, ethanol, isopropanol.

26. The process of any one of claims 20 to 25, wherein the liquid phase reaction is conducted under autogenous pressure; or wherein the liquid phase reaction is conducted at temperatures between about 50°C to about 160°.

27. The process of any one of claims 20 to 26, wherein the catalyst is selected from the group consisting of a metal halide, a zinc salt, a phase transfer catalyst and combinations thereof.

28. The process of claim 27, wherein the catalyst is selected from the group consisting of zinc chloride, zinc acetate, ammonium salt, phosphonium salts, quaternary ammonium salts such as tetrabutylammonium salt or Aliquat 336.

29. A process of making 1,1-difluoropropene (HFO-1252zc) comprising:

    i. contacting 1,1,2,3-tetrachloro-1-propene (HCO-1230xa) and HF in the presence of a first catalyst to form 2,3-dichloro-3,3-difluoropropene (HCFO-1232xf);

    ii. contacting the HCFO-1232xf and hydrogen in the presence of a second catalyst to make 1,2-dichloro-1,1-difluoropropane (HCFC-252dc); and

    iii. contacting the HCFC-252dc with hydrogen in the presence of a third catalyst to make HFO-1252zc, or contacting the HCFC-252dc and a metal in the presence of a fourth catalyst to make HFO-1252zc.

30. A process of making 1,1-difluoropropene (HFO-1252zc) comprising:

    i. providing a 2-chloro-3,3,3-trifluoropropene (HCFO-1233xf) feed,

    ii. contacting the HCFO-1233xf feed and HCl in the presence of a first catalyst to make 2,3-dichloro-3,3-difluoropropene (HCFO-1232xf),

    iii. contacting the HCFO-1232xf and hydrogen in the presence of a second catalyst to make 1,2-dichloro-1,1-difluoropropane (HCFC-252dc), and

    iv. contacting the HCFC-252dc with hydrogen in the presence of third catalyst to make HFO-1252zc, or contacting HCFC-252dc and a metal in the presence of a fourth catalyst to make HFO-1252zc.

31. The process of claim 30, further comprising contacting 1,1,2,3-tetrachloro-1-propene (HCO-1230xa) and HF in the presence of a catalyst to form a reaction mixture comprising the HCFO-1233xf feed.