CLAIMS

What is claimed is:

1. A method of producing a fluoroolefin comprising:

coupling 3,3-dichloro-1,1,1,2,2-pentafluoropropane (CF_3-CF_2-$CHCl_2$) in a liquid phase in the presence of a catalyst to form a composition comprising 1,1,1,2,2,5,5,6,6,6-decafluoro-3-hexene ($CF_3CF_2CH=CHCF_2CF_3$).

2. The method of claim 1, wherein the coupling occurs in an aprotic solvent.

3. The method of claim 2, wherein the aprotic solvent is selected from the group consisting of dimethylformamide, dimethylacetamide, dimethyl sulfoxide, and N-methylpyrrolidone.

4. The method of claim 1, wherein the catalyst is selected from the group consisting of 2,2-bipyridine, a copper(I) salt, and a combination thereof.

5. The method of claim 4, wherein the copper(I) salt is selected from the group consisting of CuCl, CuBr, CuI, and copper(I) acetate.

6. The method of claim 1, wherein the coupling occurs in the presence of copper powder.

7. A composition formed by the method of claim 1.

8. A method of producing a fluoroolefin comprising:

coupling $C_2F_5CHCl_2$ in the presence of a first catalyst to form a composition comprising $C_2F_5CH=CHC_2F_5$.

9. The method of claim 8, wherein the coupling occurs in an aprotic solvent.

10. The method of claim 9, wherein the aprotic solvent is selected from the group consisting of dimethylformamide, dimethylacetamide, dimethyl sulfoxide, and N-methylpyrrolidone.

11. The method of claim 8, wherein the first catalyst is selected from the group consisting of 2,2-bipyridine, a copper(I) salt, and a combination thereof.

12. The method of claim 11, wherein the copper(I) salt is selected from the group consisting of CuCl, CuBr, CuI, and copper(I) acetate.

13. The method of claim 8, wherein the coupling occurs in the presence of copper powder.

14. A method for exchanging thermal energy with an electronic component comprising providing an electronic component and contacting a composition including one of HFO-153-10mczz fluoroolefins comprising *E*-$C_2F_5CF=CFC_2F_5$ (E-HFO-151-12mcyy), *E*-$C_2F_5CH=CHC_2F_5$,(E-HFO-153-10mczz), $C_3F_7CH=CHCF_3$ (HFO-153-10mzz), $(CF_3)_2CFCH=CHCF_3$ (HFO-153-10mzzy), *Z*-$C_2F_5CF=CFC_2F_5$ ($_Z$-FO-151-12mcyZ), directly and/or indirectly with the electronic component to regulate the component temperature.

15. A method for transferring thermal energy, comprising providing at least one electrical component requiring thermal management from one of a hybrid electric vehicle (HEV), mild hybrids electric vehicles (MHEV), plug-in hybrid electric vehicles (PHEV), or electric vehicles (EV), circulating a thermal regulating fluid to directly/indirectly thermally contact at least one electrical component wherein said thermal regulating fluid comprises at least one of fluoroolefins comprising *E*-$C_2F_5CF=CFC_2F_5$ (E-HFO-151-12mcyy), *E*-$C_2F_5CH=CHC_2F_5$,(E-HFO-153-10mczz), $C_3F_7CH=CHCF_3$ (HFO-153-10mzz), $(CF_3)_2CFCH=CHCF_3$ (HFO-153-10mzzy), *Z*-$C_2F_5CF=CFC_2F_5$ ($_Z$-FO-151-12mcyZ), and thermally regulates the thermal condition of said at least one component.

16. A method for transferring thermal energy between a working fluid and an electrical component, comprising contacting an electrical component selected from one of:

a) a television, cell phone, monitors, drone, and avionics device; battery, powertrains for electronic vehicles, insulated-gate bipolar transistors (IGBTs), electronic devices–data center servers, computer server systems, telecommunication infrastructure, 5G network; displays, and military electronics, or

b) a high temperature mechanical vapor compression heat pump (HTHP), stationary air conditioning and chiller, and Organic Rankine Cycle (ORC)

with a working fluid comprising at least one of fluoroolefins comprising *E*-$C_2F_5CF=CFC_2F_5$ (E-HFO-151-12mcyy), *E*-$C_2F_5CH=CHC_2F_5$,(E-HFO-153-

10mczz), $C_3F_7CH=CHCF_3$ (HFO-153-10mzz), $(CF_3)_2CFCH=CHCF_3$ (HFO-153-10mzzy), *Z*-$C_2F_5CF=CFC_2F_5$ (Z-FO-151-12mcyZ), and thermally regulating the thermal condition of said at least one component.

17. A system for transferring thermal energy between a working fluid and an electrical component, comprising a component containing from one of:

    a) a television, cell phone, monitors, drone, and avionics device; battery, powertrains for electronic vehicles, insulated-gate bipolar transistors (IGBTs), electronic devices–data center servers, computer server systems, telecommunication infrastructure, 5G network; displays, and military electronics, or

    b) a high temperature mechanical vapor compression heat pump (HTHP), stationary air conditioning and chiller, and Organic Rankine Cycle (ORC)

    and working fluid circuit fluid comprising at least one of fluoroolefins comprising *E*-$C_2F_5CF=CFC_2F_5$ (E-HFO-151-12mcyy), *E*-$C_2F_5CH=CHC_2F_5$,(E-HFO-153-10mczz), $C_3F_7CH=CHCF_3$ (HFO-153-10mzz), $(CF_3)_2CFCH=CHCF_3$ (HFO-153-10mzzy), *Z*-$C_2F_5CF=CFC_2F_5$ (Z-FO-151-12mcyZ) in energy exchanging contact with said component to thermally regulate the thermal condition of said one component.

18. A method for transferring thermal energy between at least one of fluoroolefins comprising *E*-$C_2F_5CF=CFC_2F_5$ (E-HFO-151-12mcyy), *E*-$C_2F_5CH=CHC_2F_5$,(E-HFO-153-10mczz), $C_3F_7CH=CHCF_3$ (HFO-153-10mzz), $(CF_3)_2CFCH=CHCF_3$ (HFO-153-10mzzy), *Z*-$C_2F_5CF=CFC_2F_5$ (Z-FO-151-12mcyZ) and an electrical component by immersion.

19. A method for transferring thermal energy by immersion by selecting fluids which exhibit a dielectric constant suitable for electrical applications and exhibiting a low dielectric constant to provide increased electrical isolation of the electrical components, and immersing the electrical component in at least one of fluoroolefins comprising *E*-$C_2F_5CF=CFC_2F_5$ (E-HFO-151-12mcyy), *E*-$C_2F_5CH=CHC_2F_5$,(E-HFO-153-10mczz), $C_3F_7CH=CHCF_3$ (HFO-153-10mzz), $(CF_3)_2CFCH=CHCF_3$ (HFO-153-10mzzy), *Z*-$C_2F_5CF=CFC_2F_5$ (Z-FO-151-12mcyZ).

20. The method of claim 19, wherein the dielectric working fluid including at least E-HFO-153-10mczz having a dielectric constant over the operational frequency range (0 to 20 GHz) of less than 7.3, or less than 5.5, or less than 5.0, or less than 4.0, or less than 3.5, or less than 2.7, or less than 2.5, or less than 2.0, or less than 1.9, or less than 1.8, or less than 1.5.