CLAIMS

What is claimed is:

1. A method for making a fluorinated catalyst support, comprising:

forming a mixture of a support material that can be fluorinated and a fluoride donor;

adding the mixture to a fluidized bed reactor;

fluidizing the mixture in the fluidized bed reactor with a fluidizing gas by maintaining a flow rate of the fluidizing gas of about 0.1 ft. / sec at less than about 370 °C and greater than about 0.35 ft./ sec at temperatures greater than about 370 °C; and

calcining the mixture to decompose the fluoride donor, forming a fluorinated support.

2. The method of claim 1, comprising maintaining a ratio of a pressure drop across a distributor plate to a pressure drop across the fluidized bed of greater than about 7 %.

3. The method of claim 1, comprising forming a fluidized bed with a height to diameter ratio of at least about 2.3.

4. The method of claim 1, comprising increasing a flow rate of the fluidizing gas from about 0.1 ft. / sec. to about 0.4 ft./ sec starting at a temperature of between about 350 °C and about 370 °C.

5. The method of claim 1, comprising maintaining a filter face velocity of less than about 4 ft./ sec.

6. The method of claim 1, comprising increasing a temperature of the fluidized bed at about 30 °C per hour from about 230 °C to about 370 °C.

7. The method of claim 1, wherein the fluoride donor comprises ammonium hexafluorosilicate, ammonium bifluoride, ammonium tetrafluoroborate, or any combination thereof; or

comprising forming the mixture by impregnating the catalyst support with the fluoride donor by: dissolving the fluoride donor in a solvent; treating the catalyst support with the fluoride donor to form an impregnated catalyst support; and drying the impregnated catalyst support; or

comprising forming the mixture by dry blending the support material with the fluoride donor; or

comprising: adding a portion of the fluoride donor to the support material; calcining to form a partially fluoride support; and repeating the addition and the calcination; or

comprising milling the fluoride donor to form smaller particles.

8. The method of claim 1, wherein the calcining occurs at a temperature of from about 200 °C to about 1000 °C to produce the support.

9. The method of claim 1, comprising forming a catalyst system by either:

combining a catalyst compound with the fluorinated catalyst support, and an aluminoxane, wherein the aluminoxane is present in an amount of about 10 mmol or less per gram of the catalyst support; or

combining a catalyst compound and an aluminoxane to produce a first mixture; and adding the catalyst support to the first mixture and drying to produce the catalyst system.

10. A catalyst system, comprising:

a catalyst compound;

a support comprising a fluorinated support, wherein the fluorinated support is generated by heating a mixture of a catalyst support that can be fluorinated and a fluoride donor compound in a fluidized bed reactor that is fluidized by maintaining a flow rate of a fluidizing gas of about 0.1 ft. / sec at less than about 370 °C and greater than about 0.35 ft./ sec at temperatures greater than about 370 °C; and

an aluminoxane, wherein the aluminoxane is present in an amount of about 10 mmol or less per gram of the support.

11. The catalyst system of claim 10, wherein a ratio of a pressure drop across a distributor plate to a pressure drop across the fluidized bed is maintained at greater than about 7 %.

12. The catalyst system of claim 10, wherein a flow rate of the fluidizing gas is increased from about 0.1 ft. / sec. to about 0.4 ft./ sec starting at a temperature of between about 350 °C and about 370 °C.

13. The catalyst system of claim 10, wherein the support is generated in a fluidized bed reactor with a height to depth ratio of a fluidized bed of at least about 2.3.

14. The catalyst system of claim 10, wherein the support has a fluoride concentration ranging from about 1 wt. % to about 10 wt. %, based on a weight of the support and an aluminum concentration ranging from about 3 wt. % to about 40 wt. % based on the weight of the support.

15. The catalyst system of claim 10, wherein the support has a fluoride concentration ranging from about 4 wt. % to about 8 wt. %, based on a weight of the support and an aluminum concentration ranging from about 20 wt. % to about 40 wt. % based on the weight of the support.

16. The catalyst system of claim 10, wherein the support has a fluoride concentration ranging from about 2 wt. % to about 4 wt. %, based on a weight of the support and an aluminum concentration ranging from about 3 wt. % to about 10 wt. % based on the weight of the support.

17. The catalyst system according to claim 10, wherein the concentration on metal from the catalyst compound ranges from about 0.2 wt. % to about 1.3 wt. %, based on a total weight of the catalyst system.

18. The catalyst system according to claim 10, wherein the aluminoxane is present:

in an amount of about 4 mmol or less per gram of the support; or

in an amount of about 2.7 mmol or less per gram of the support, wherein the aluminoxane comprises methylaluminoxane, modified methylaluminoxane, or a combination thereof.

19. The catalyst system according to claim 10, wherein the support further comprises silica.

20. The catalyst system according to claim 10, wherein the catalyst compound comprises a metallocene catalyst; or

$$Cp^ACp^BMX_n \text{ or } Cp^A(A)Cp^BMX_n,$$

wherein M is a Group 4, 5 or 6 atom; Cp^A and Cp^B are each bound to M and are independently selected from the group consisting of cyclopentadienyl ligands, substituted cyclopentadienyl ligands, ligands isolobal to cyclopentadienyl and substituted ligands isolobal to cyclopentadienyl; (A) is a divalent bridging group bound to both Cp^A and Cp^B selected from the group consisting of divalent C_1 to C_{20} hydrocarbyls and C_1 to C_{20} heteroatom containing hydrocarbonyls, wherein the heteroatom containing hydrocarbonyls comprise from one to three heteroatoms; X is a leaving group selected from the group consisting of chloride ions, bromide ions, C_1 to C_{10} alkyls, and C_2 to C_{12} alkenyls, carboxylates, acetylacetonates, and alkoxides; and n is an integer from 1 to 4.