CLAIMS

What is claimed is:

1. A process for preparing polybutene having an exo-olefin content of at least 50 mol. %, the process comprising contacting isobutene or isobutene-containing feedstock with a Lewis acid catalyst complexed with a Lewis base, in a substantially or completely apolar polymerization medium, and initiating polymerization of said isobutene or isobutene-containing feedstock with an initiator;

wherein said Lewis acid catalyst is a Lewis acid of the formula $R'AlCl_2$, wherein R' is a hydrocarbyl group;

wherein said Lewis base is a dihydrocarbyl ether wherein each hydrocarbyl group is independently selected from hydrocarbyl groups having 1 to 8 carbon atoms and one or both hydrocarbyl groups of the dihydrocarbyl ether are substituted with an electron withdrawing group;

wherein the initiator is a compound of the formula RX, wherein X is a halide, R is a hydrocarbyl group capable of forming a stable carbocation, and R is linked to X by a carbon that is tertiary, benzylic or allylic; and

wherein polymerization is conducted in the presence of a hindered alcohol or hindered alkoxyaluminum dichloride.

2. The process of claim 1, wherein R' is an alkyl group having 1 to 12 carbons.

3. The process of claim 1, wherein said Lewis base is dihydrocarbyl ether wherein each hydrocarbyl group is independently selected from alkyl groups having 1 to 4 carbon atoms.

4. The process of claim 1, wherein one or both hydrocarbyl groups of said dihydrocarbyl ether Lewis base are substituted with a chlorine atom.

5. The process of claim 3, wherein one or both hydrocarbyl groups of said dihydrocarbyl ether Lewis base are substituted with a chlorine atom.

6. The process of claim 1, wherein the Lewis acid and Lewis base are complexed in a solvent selected from liquid, apolar, non-halogenated aliphatic solvents and liquid, aromatic solvents.

7. The process of claim 6, wherein said solvent is hexanes or mixed, saturated aliphatic or alicyclic hydrocarbons.

8. The process of claim 1, wherein said apolar polymerization medium is selected from saturated C_4 hydrocarbons, unsaturated C_4 hydrocarbons, and mixtures thereof.

9. The process of claim 1, wherein said isobutene or isobutene-containing feedstock is selected from pure isobutene; a C_4 refinery cut containing between about 20-50% isobutene, between 5% and about 50% butene-1, between about 2% and about 40% butene-2, between about 2% and about 60% iso-butane, between about 2% and about 20% n-butane, and up to about 0.5% butadiene, wherein all percentages are by mass, based on the total mass of the C_4 refinery cut; and mixtures of pure isobutene and said C_4 refinery cut.

10. The process of claim 1, wherein molar ratio of Lewis acid to Lewis base in said Lewis acid.Lewis base complex is from about 0.9:1 to about 1:8.

11. The process of claim 1, wherein said complex is contacted with said isobutene or isobutene-containing feedstock at a concentration of millimoles of Lewis acid.Lewis base complex per liter of feedstock of from about 0.2 mM to about 200 mM.

12. The process of claim 10, wherein said complex is contacted with said isobutene or isobutene-containing feedstock at a concentration of millimoles of Lewis acid.Lewis base complex per liter of feedstock of from about 0.2 mM to about 200 mM.

13. The process of claim 1, wherein polymerization is conducted in the presence of a tertiary alcohol.

14. The process of claim 11, wherein said tertiary alcohol is selected from the group consisting of t-butanol, t-amyl alcohol and 3-ethyl 3-pentanol.

15. The process of claim 14, wherein said tertiary alcohol is t-butanol.

16. The process of claim 12, wherein polymerization is conducted in the presence of from about 0.05 mM to about 3 mM tertiary alcohol per liter of feedstock.

17. The process of claim 12, wherein polymerization is conducted in the presence of a concentration of tertiary alcohol that is from about 0.5% to about 30% of the Lewis acid.Lewis base complex concentration.

18. The process of claim 13, wherein polymerization is conducted in the presence of from about 0.05 mM to about 3 mM tertiary alcohol per liter of feedstock.

19. The process of claim 13, wherein polymerization is conducted in the presence of a concentration of tertiary alcohol that is from about 0.5% to about 30% of the Lewis acid.Lewis base complex concentration.

20. The process of claim 1, wherein polymerization is conducted in the presence of hindered alkoxyaluminum dichloride.

21. The process of claim 20, wherein said hindered alkoxyaluminum dichloride is t-$BuOAlCl_2$.

22. The process of claim 20, wherein polymerization is conducted in the presence of from about 0.05 mM to about 10 mM alkoxyaluminum dichloride per liter of feedstock.

23. The process of claim 21, wherein polymerization is conducted in the presence of from about 0.05 mM to about 10 mM t-$BuOAlCl_2$ per liter of feedstock.

24. The process of claim 1, wherein the polymerization process is conducted continuously.

25. The process of claim 1, wherein said polybutene product has an exo-olefin content of at least 70 mol. %.

26. The process of claim 1, wherein said polybutene product has a number average molecular weight (Mn) of from about 400 Daltons to about 4000 Daltons.