CLAIMS

1. A procatalyst system suitable for making an olefin polymerization catalyst and consisting essentially of a blend of (A) a pre-made solid procatalyst and (B) a (multi-alkoxy)silane; wherein the (A) pre-made solid procatalyst consists essentially of a titanium compound, magnesium chloride solids, and optionally a silica; wherein the magnesium chloride solids consist essentially of $MgCl_2$ and at least one oxaheterocycle; and wherein the procatalyst system is free of any other electron donor organic compound.

2. The procatalyst system of claim 1 wherein the (B) (multi-alkoxy)silane is an aromatic (multi-alkoxy)silane of formula (I): $R^1_mH_nSi(OR^2)_{4-m-n}$ (I); wherein subscript m is 0 and subscript n is 0, 1, or 2 or wherein subscript m is 1 and subscript n is 0 or 1 or wherein subscript m is 2 and subscript n is 0; wherein R^1 is an unsubstituted (C_1-C_{20})alkyl group, an unsubstituted (C_3-C_{12})cycloalkyl group, a (C_1-C_{10})alkyl-substituted (C_3-C_{12})cycloalkyl group, a (C_3-C_{10})cycloalkyl-substituted (C_1-C_{10})alkyl group, an unsubstituted (C_6-C_{12})aryl group, a (C_1-C_{10})alkyl-substituted (C_6-C_{10})aryl group, or an unsubstituted (C_7-C_{20})aralkyl group; and wherein R^2 is an unsubstituted (C_1-C_{20})alkyl group, an unsubstituted (C_3-C_{12})cycloalkyl group, a (C_1-C_{10})alkyl-substituted (C_3-C_{12})cycloalkyl group, a (C_3-C_{10})cycloalkyl-substituted (C_1-C_{10})alkyl group, or an unsubstituted (C_7-C_{20})aralkyl group.

3. The procatalyst system of any one of claims 1 to 2 wherein the (B) (multi-alkoxy)silane is an aromatic (multi-alkoxy)silane of formula (Ia): $R^1_mSi(OR^2)_{4-m-n}$ (Ia); wherein subscript m is 0, 1, or 2; wherein R^1 is an unsubstituted (C_1-C_{20})alkyl group, an unsubstituted (C_3-C_{12})cycloalkyl group, a (C_1-C_{10})alkyl-substituted (C_3-C_{12})cycloalkyl group, a (C_3-C_{10})cycloalkyl-substituted (C_1-C_{10})alkyl group, an unsubstituted (C_6-C_{12})aryl group, a (C_1-C_{10})alkyl-substituted (C_6-C_{10})aryl group, or an unsubstituted (C_7-C_{20})aralkyl group; and wherein R^2 is an unsubstituted (C_1-C_{20})alkyl group, an unsubstituted (C_3-C_{12})cycloalkyl group, a (C_1-C_{10})alkyl-substituted (C_3-C_{12})cycloalkyl group, a (C_3-C_{10})cycloalkyl-substituted (C_1-C_{10})alkyl group, or an unsubstituted (C_7-C_{20})aralkyl group.

4. The procatalyst system of any one of claims 1 to 3 wherein the magnesium chloride solids consist essentially of $MgCl_2$ and an oxaheterocycle selected from the group consisting of an unsubstituted cyclic (C_2-C_6)ether; furan; dihydrofuran; pyran; dihydropyran; tetrahydropyran; 1,4-dioxane; a difuranyl-(C_1-C_6)alkylene; a bis(tetrahydrofuranyl)-(C_1-C_6)alkylene; and a (C_1-C_3)alkyl-substituted derivative of any one thereof.

5. The procatalyst system of any one of claims 1 to 3 wherein the magnesium chloride,

solids consist essentially of $MgCl_2$ and an oxaheterocycle selected from tetrahydrofuran.

6. The procatalyst system of any one of claims 1 to 5 wherein the titanium compound is at least one compound of formula (III): TiX_4 (III), wherein each X independently is Cl, Br, I, or a (C_1-C_{12})alkoxy, alternatively a (C_1-C_6)alkoxy.

7. The procatalyst system of any one of claims 1 to 6 further consisting essentially of a ligand-metal complex of formula (IV): MX_4 (IV), wherein M is Hf or Zr and each X independently is Cl, Br, I, or a (C_1-C_6)alkoxy.

8. A method of synthesizing a procatalyst system, the method comprising drying a mixture consisting essentially of a solution and, optionally, a silica, and being free of (B) a (multi-alkoxy)silane and any other electron donor organic compound, wherein the solution consists essentially of a titanium compound, magnesium chloride, and the at least one oxaheterocycle mixed in a hydrocarbon solvent; thereby removing the hydrocarbon solvent from the mixture and crystallizing the magnesium chloride so as to give (A) a pre-made solid procatalyst; and contacting the (A) pre-made solid procatalyst with the (B) (multi-alkoxy)silane; thereby making the blend of the procatalyst system of any one of claims 1 to 7.

9. A method of making a catalyst system suitable for polymerizing an olefin, the method comprising contacting the procatalyst system of any one of claims 1 to 7, or the procatalyst system made by the method of claim 8, with an activating effective amount of (C) an activator, thereby making the catalyst system; wherein the catalyst system is free of the any other electron donor organic compound and is suitable for polymerizing an olefin.

10. A method of making a catalyst system suitable for polymerizing an olefin, the method comprising simultaneously or sequentially contacting an activating effective amount of (C) an activator, (B) a (multi-alkoxy)silane, and (A) a pre-made solid procatalyst, thereby making the catalyst system; wherein the (A) pre-made solid procatalyst consists essentially of a titanium compound, magnesium chloride solids, and optionally a silica; wherein the magnesium chloride solids consist essentially of $MgCl_2$ and the at least one oxaheterocycle; and wherein the catalyst system is free of the any other electron donor organic compound and is suitable for polymerizing an olefin.

11. A catalyst system made by the method of claim 9 or 10.

12. A method of synthesizing a polyolefin polymer, the method comprising contacting at least one olefin monomer with the catalyst system of claim 11 under effective polymerization conditions in a polymerization reactor, thereby making the polyolefin polymer.