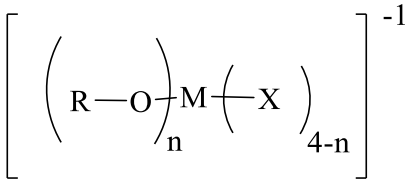
CLAIMS

1. A process of polymerizing olefins, the process comprising contacting ethylene and a (C_3–C_{40})alpha-olefin comonomer in the presence of a catalyst system to produce an ethylene-based polymer, the catalyst system comprising a procatalyst and an ionic metallic activator complex, the ionic metallic activator complex comprising an anion and a countercation, the anion having a structure according to formula (I):



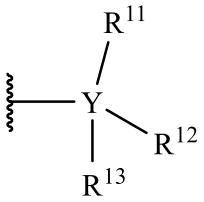
(I)

where:

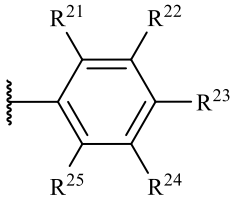
M is aluminum, boron, or gallium;

n is ~~2,~~ 3~~,~~ or 4;

each R is independently selected from the group consisting of radicals having formula (II) and radicals having formula (III):



(II)



(III)

each Y is independently carbon or silicon;

each R^{11}, R^{12}, R^{13}, R^{21}, R^{22}, R^{23}, R^{24}, and R^{25} is independently chosen from (C_1–C_{40})alkyl, (C_6–C_{40})aryl, –OR^C, ~~= O =,~~ –SR^C, –H, or –F, wherein when R is a radical according to formula (III), at least one of R^{21}, R^{22}, R^{23}, R^{24}, or R^{25} is a halogen-substituted (C_1–C_{40})alkyl , a halogen-substituted (C_6–C_{40})aryl, or –F; and

provided that:

when each R is a radical according to formula (II) and Y is carbon, at least one of R^{11}, R^{12}, or R^{13} is a halogen-substituted (C_1–C_{40})alkyl , a halogen-substituted (C_6–C_{40})aryl, or –F; ~~or~~and

when M is aluminum and n is 4 and each R is a radical according to formula (II), and each Y is carbon:

each R^{11}, R^{12}, and R^{13} of each R is a halogen- substituted $(C_1–C_{40})$alkyl, a halogen-substituted $(C_6–C_{40})$aryl, or –F; or

at least one of R^{11}, R^{12}, or R^{13} is −H and a total number of halogen atoms in R^{11}, R^{12}, and R^{13} of each R is at least six;

each X is a monodentate ligand independently chosen from halogen-substituted $(C_1–C_{20})$alkyl, $(C_1–C_{20})$alkyl, halogen-substituted $(C_6–C_{40})$aryl, $(C_6–C_{40})$aryl, triflate, or $–S(O)_3R^C$;

optionally, two groups R in formula (I) are covalently connected;

each R^C is independently $(C_1–C_{30})$hydrocarbyl or –H;

wherein

when n is 4, no more than one R is a radical having formula (II); and

the countercation is $^+N(H)R^N_3$, where each R^N is chosen from $(C_1–C_{20})$alkyl or $(C_6–C_{20})$aryl; $^+C(C_6H_5)_3$; or $^+C(C_6H_4R^C)_3$, where R^C is $(C_1–C_{20})$alkyl;

the procatalyst is selected from the group consisting of Group IV metal-ligand complexes (Group IVB according to CAS or Group 4 according to IUPAC naming conventions).

2. The ~~polymerization~~ process according to claim 1, wherein the procatalyst is a bis(phenylphenoxy) metal−ligand complex.

3. The ~~polymerization~~ process according to claim 1 or claim 2, wherein n is 4 and each R is independently $-C(H)(CF_3)_2$, $-C_6F_5$, or $-C(CF_3)_3$.

4. The ~~polymerization~~ process according to claim 1 or claim 2, wherein n is 3 and X is chosen from ~~–OH,~~ triflate (−OTf), methyl, or halogen.

5. The ~~polymerization~~ process according to claim 1 or claim 2, wherein n is 4, and three of ~~the~~ four groups R are $-C(CF_3)_3$ and one of ~~the~~ four groups R is $–C_6F_5$.

~~6. The polymerization process according to any one of the following claims, wherein the countercation has a formal change of positive one (+1).~~

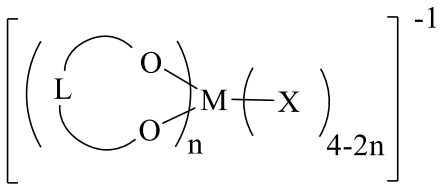
~~7~~6. The ~~polymerization~~ process according to any one of claims 1−~~6~~5, wherein the countercation is $^+N(H)R^N_3$, where each R^N is chosen from $(C_1–C_{20})$alkyl or $(C_6–C_{20})$aryl.

~~8~~7. The ~~polymerization~~ process according to any one of claims 1–~~6~~5, wherein the countercation is $^{+}N(H)R^{N}_{3}$, where ~~each where~~ at least two R^{N} are chosen from $(C_{10}–C_{20})$alkyl.

~~9~~8. The ~~polymerization~~ process according to any one of claims 1–~~6~~5, wherein the countercation is $^{+}C(C_{6}H_{5})_{3}$.

~~10~~9. The ~~polymerization~~ process according to any one of claims 1–~~6~~5, wherein the countercation is $^{+}C(C_{6}H_{4}R^{C})_{3}$, where R^{C} is $(C_{1}–C_{20})$alkyl.

~~11~~10**.** The ~~polymerization~~ process according to claim 1, wherein two groups R are covalently connected and the anion has a structure according to formula (IV):



(IV)

where:

M and X are as defined in formula (I);

n is ~~1 or~~ 2;

L represents the two groups R that are covalently connected;

each L is independently chosen from $(C_{2}–C_{40})$alkylene, $(C_{2}–C_{40})$heteroalkylene or ~~or~~ $–(Si(R^{C})_{2}–O)_{z}–Si(R^{C})_{2}–$, where z is 0, 1, 2, or 3; and wherein R^{C} is independently $(C_{1}–C_{30})$hydrocarbyl or –H; and

when n is 1, X is a monodentate ligand independently chosen from halogen, halogenated-$(C_{1}–C_{20})$alkyl, or triflate.

~~15~~11. The ~~polymerization~~ process according to any one of the preceding claims, wherein the ionic metallic activator complex in a high-boiling-point fully saturated hydrocarbon solution having a concentration of 200 micromoles of ionic metallic activator complex and 20 millimoles of water in a high-boiling-point fully saturated hydrocarbon solution has a percent dissipation factor of less than or equal to 0.1 as measured by ~~the~~ a Hydrocarbon Conductivity Test.