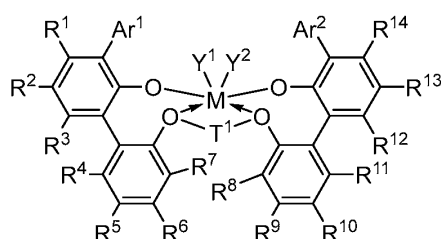


Claims

1. A process comprising:
 - contacting ethylene and octene under polymerization conditions at a temperature greater than 125°C with a catalyst system comprising
 - (i) a first polymerization catalyst having the structure of Formula (III)

Formula (III)



wherein

M is titanium, zirconium, or hafnium;

each Y¹ and Y² is independently selected from the group consisting of (C₁-C₄₀)hydrocarbyl, (C₁-C₄₀)trihydrocarbylsilylhydrocarbyl, halogen, alkoxide, or amine, or two Y groups together are a divalent hydrocarbylene, hydrocarbadiyl or trihydrocarbylsilyl group;

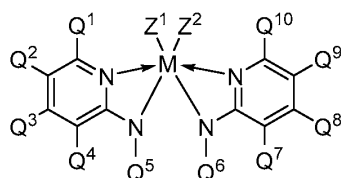
each Ar¹ and Ar² independently is selected from the group consisting of (C₆-C₄₀)aryl, substituted (C₆-C₄₀)aryl, (C₃-C₄₀)heteroaryl, and substituted (C₃-C₄₀)heteroaryl;

T¹ independently at each occurrence is a saturated C₂-C₄ alkyl that forms a bridge between the two oxygen atoms to which T¹ is bonded; and

each R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, R⁹, R¹⁰, R¹¹, R¹², R¹³, and R¹⁴ independently is selected from the group consisting of hydrogen, a halogen, (C₁-C₄₀)hydrocarbyl, substituted (C₁-C₄₀)hydrocarbyl, (C₁-C₄₀)heterohydrocarbyl, substituted (C₁-C₄₀)heterohydrocarbyl, (C₆-C₄₀)aryl, substituted (C₆-C₄₀)aryl, (C₃-C₄₀)heteroaryl, and substituted (C₃-C₄₀)heteroaryl, and nitro (NO₂);

- (ii) a second polymerization catalyst having the structure of Formula (I)

Formula (I)



wherein

M is titanium, zirconium, or hafnium,

each Z¹ and Z² is independently selected from the group consisting of (C₁-C₄₀)hydrocarbyl, (C₁-C₄₀)trihydrocarbylsilylhydrocarbyl, halogen, alkoxide, or amine, or two Z groups together are a divalent hydrocarbylene, hydrocarbadiyl or trihydrocarbylsilyl group;

each Q¹ and Q¹⁰ independently is selected from the group consisting of (C₆-C₄₀)aryl, substituted (C₆-C₄₀)aryl, (C₃-C₄₀)heteroaryl, and substituted (C₃-C₄₀)heteroaryl;

each Q², Q³, Q⁴, Q⁷, Q⁸, and Q⁹ independently is selected from the group consisting of hydrogen, (C₁-C₄₀)hydrocarbyl, substituted (C₁-C₄₀)hydrocarbyl, (C₁-C₄₀)heterohydrocarbyl, substituted (C₁-C₄₀)heterohydrocarbyl, halogen, and nitro (NO₂);

each Q⁵ and Q⁶ independently is selected from the group consisting of (C₁-C₄₀)alkyl, substituted (C₁-C₄₀)alkyl, and [(Si)₁-(C+Si)₄₀] substituted organosilyl;

each N independently is nitrogen;

optionally, two or more of the Q¹⁻⁵ groups combine together to form a ring structure, with such ring structure having from 5 to 16 atoms in the ring excluding any hydrogen atoms; and

optionally, two or more of the Q⁶⁻¹⁰ groups can combine together to form a ring structure, with such ring structure having from 5 to 16 atoms in the ring excluding any hydrogen atoms; and

optionally, two or more of the Q^{6-10} groups can combine together to form a ring structure, with such ring structure having from 5 to 16 atoms in the ring excluding any hydrogen atoms;

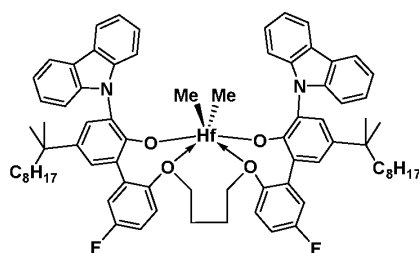
(iii) a chain shuttling agent; and

forming an ethylene/octene multi-block copolymer having a normalized OOO triad content greater than 0.25.

2. The process of claim 1 comprising contacting the ethylene and octene under polymerization conditions at a temperature from 130°C to 170°C with a catalyst system comprising

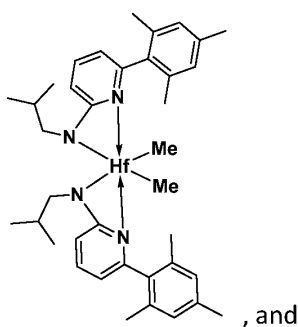
(i) a first polymerization catalyst having a structure of catalyst 1

catalyst 1



(ii) a second polymerization catalyst having a structure of catalyst 2

catalyst 2



(iii) a chain shuttling agent that is diethyl zinc; and

forming an ethylene/octene multi-block copolymer having hard segments and soft segments, the soft segments having a soft segment melting temperature (SS-Tm) from -30°C to 30°C, the ethylene/octene multi-block copolymer having a first TGIC peak temperature (T_{p1}) and a second TGIC peak temperature (T_{p2})

wherein T_{p2} fulfills Equation (A)

$$T_{p2} \leq 0.0068 \times (SS-Tm)^2 + 0.07 \times (SS-Tm) + 73.2.$$

3. A composition comprising:

an ethylene/octene multi-block copolymer having a normalized OOO triad content greater than 0.25.

4. The composition of claim 3 wherein the ethylene/octene multi-block copolymer comprises from 10 mol % to 30 mol % of octene.

5. The composition of claim 4 wherein

the ethylene/octene multi-block copolymer comprises hard segments and soft segments, the soft segments having a soft segment melting temperature (SS-Tm) from -30°C to 30°C, the ethylene/octene multi-block copolymer having a first TGIC peak temperature (T_{p1}) and a second TGIC peak temperature (T_{p2})

wherein T_{p2} fulfills Equation (A)

$$T_{p2} \leq 0.0068 \times (SS-Tm)^2 + 0.07 \times (SS-Tm) + 73.2.$$

6. The composition of claim 5 wherein the ethylene/octene multi-block copolymer has T_{p1} from 125°C to 150°C and a T_{p2} from 68°C to 90°C.

7. The composition of claim 6 wherein the ethylene/octene multi-block copolymer has a glass transition temperature (T_g) from -70°C to -55°C.

8. The composition of claim 7 wherein the ethylene/octene multi-block copolymer has a density from 0.855 to 0.890 grams per cubic centimeter (g/cc).

9. The composition of claim 8 wherein the ethylene/octene multi-block copolymer has an unconfined yield strength (UYS) from 0 lb/ft² to less than 200 lb/ft² at 21°C after two months.

10. The composition of any of claims 8-9 wherein the ethylene/octene multi-block copolymer has a funnel flow from greater than 150 g/s to 200 g/s after 6 weeks.
11. The composition of any of claims 8-10 wherein the ethylene/octene multi-block copolymer has an unconfined yield strength (UYS) from 0 lb/ft² to less than 73 lb/ft² at 0°C after two months.