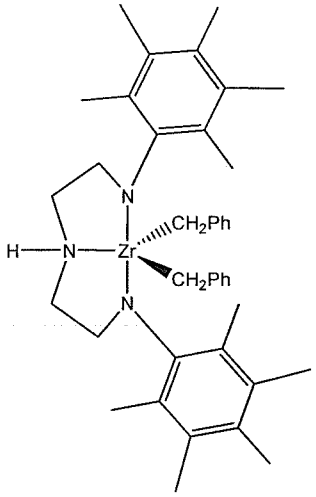


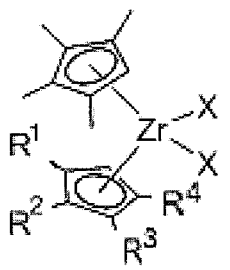
4. The bimodal polymerization catalyst system of any one of claims 1-3, where R^3 of Formula I is a C_1 to C_{20} alkyl.

5. The bimodal polymerization catalyst system of any one of claims 1-4, where R^1 and R^2 of Formula I together, with the carbon atoms to which they are bonded, form a cycloalkyl group.

6. A bimodal polyethylene composition comprising a high molecular weight polyethylene component and a low molecular weight polyethylene component, wherein the ratio of the weight average molecular weight of the high molecular weight component to the weight average molecular weight of the low molecular weight component of the composition is from 1:3 to 1:50, and wherein the high and low molecular weight polyethylene components are formed together in a single reactor via a polymerization process employing a bimodal polymerization catalyst system comprising:

a non-metallocene olefin polymerization catalyst; and

a zirconocene catalyst of the formula:



(Formula I)

where each of R^1, R^2, and R^4, are independently a C_1 to C_{20} alkyl, aryl or aralkyl group or a hydrogen, where R^3 is a C_1 to C_{20} alkyl, aryl or aralkyl group, and where each X is independently a halide, C_1 to C_{20} alkyl, aralkyl group or hydrogen.

7. The bimodal polyethylene composition of claim 6, wherein the high molecular weight (HMW) polyethylene component ethylene-based units and a 1-hexene comonomer present in an amount from 3.0 wt. % to 6.0 wt. % of the polyethylene at a second peak in a plot of a molecular weight distribution of the HMW polyethylene; and

the low molecular weight (LMW) polyethylene component comprises ethylene-based units and a 1-hexene comonomer being present in an amount from 1.5 wt. % to 2.5 wt. % of the polyethylene at a first peak in a plot of a molecular weight distribution of the LMW polyethylene.

8. The bimodal polymer composition of claim 7 wherein the bimodal polyethylene composition has a density of 0.940 gram/cubic centimeters to 0.970 gram/cubic centimeters; and

the bimodal polyethylene composition qualifies as a PE 100 material such that in accordance with ISO 1167 a pipe formed from the bimodal polyethylene composition that is subjected to internal pipe resistance has an extrapolated stress of 10 megapascals (MPa) or more on an internal pipe resistance curve when the internal pipe resistance curve is extrapolated to 100 years in accordance with ISO 9080:2003(E).

9. The bimodal polyethylene composition of claim 6 in which the weight average molecular weight of the low molecular weight polyethylene component is from 5,000 to 35,000 grams/mole (g/mol) as represented by a first peak in a molecular weight distribution plot of the polyethylene and

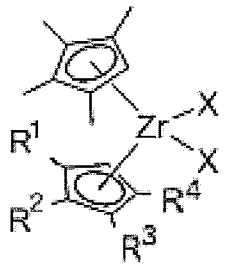
the weight average molecular weight of the high molecular weight polyethylene component is from 400,000 to 700,000 g/mol as represented by a second peak in a molecular weight distribution of the polyethylene.

10. A method of producing a bimodal polyethylene, the method comprising:

polymerizing ethylene in a single reactor in presence of a bimodal polymerization catalyst system to form the bimodal polyethylene, wherein the bimodal polymerization catalyst system comprises:

a non-metallocene olefin polymerization catalyst; and

a zirconocene catalyst of Formula I:



(Formula I)

where each of R^1, R^2, and R^4, are independently a C_1 to C_{20} alkyl, aryl or aralkyl group or a hydrogen, where R^3 is a C_1 to C_{20} alkyl, aryl or aralkyl group, and where each X is independently a halide, C_1 to C_{20} alkyl, aralkyl group or hydrogen.