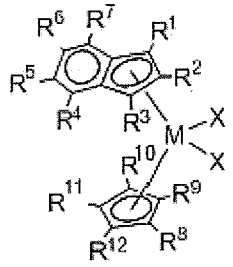
What is claimed:

1. A polymerization catalyst, the polymerization catalyst comprising a metallocene catalyst of Formula I:




(Formula I)

wherein each of $R^1$ to $R^{12}$ is independently a $C_1$ to $C_{20}$ alkyl, aryl or aralkyl group, a hydrogen, wherein at least one of $R^4$ to $R^7$ is not a hydrogen, wherein M is a Group 4 metal, and wherein, each X is independently a halide, $C_1$ to $C_{20}$ alkyl, aralkyl or hydrogen.

2. The polymerization catalyst of claim 1, wherein each of $R^9$, $R^{10}$, $R^{11}$ and $R^{12}$ of Formula I is a hydrogen; or each of $R^1$, $R^2$, and $R^3$ of Formula I is a hydrogen.

3. The polymerization catalyst of claim 1, wherein $R^5$ and $R^6$ of Formula I together form a cycloalkyl group.

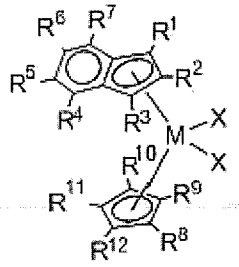
4. The polymerization catalyst of claim 3, wherein the cycloalkyl group further comprises cyclohexyl-1,1,4,4-tetramethyl.

5. The polymerization catalyst of claim 3, wherein the $R^8$ of Formula I is a $C_1$ to $C_{20}$ alkyl; or a $C_1$ to $C_3$ alkyl.

6. The polymerization catalyst of claim 1, wherein each of $R^7$ and $R^4$ of Formula I is independently a $C_1$ to $C_{20}$ alkyl; or M of Formula I further comprises titanium, zirconium or hafnium.

7. The polymerization catalyst of claim 6, wherein each of $R^1$, $R^2$, $R^3$ of Formula I is a hydrogen; or each of $R^5$ and $R^6$ of Formula I is a hydrogen.

8. A polyethylene composition comprising polyethylene formed in a single reactor via a polymerization catalyst comprising a metallocene catalyst having improved ethylene enchainment of the formula:




(Formula I)

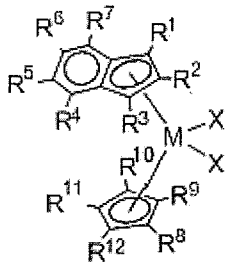
wherein each of $R^1$ to $R^{12}$ is independently a $C_1$ to $C_{20}$ alkyl, aryl or aralkyl group, or a hydrogen, wherein at least one of $R^4$ to $R^7$ is not a hydrogen, wherein M is a Group 4 metal, and wherein, each X is independently a halide, $C_1$ to $C_{20}$ alkyl, aralkyl or hydrogen.

9. The polyethylene composition of claim 8, wherein the polyethylene has a weight average molecular weight from 5,000 to 250,000 grams/mole (g/mol); or

the polyethylene having the improved ethylene enchainment has a melt temperature of from 90 degrees Celsius to 136 degrees Celsius.

10. A method of producing polyethylene having improved ethylene enchainment, the method comprising:

polymerizing ethylene in a reactor in presence of a polymerization catalyst to form the polyethylene, wherein the polymerization catalyst comprises a metallocene catalyst of Formula I:




(Formula I)

wherein each of $R^1$ to $R^{12}$ is independently a $C_1$ to $C_{20}$ alkyl, aryl or aralkyl group, or a hydrogen, wherein at least one of $R^4$ to $R^7$ is not a hydrogen, wherein M is a Group 4 metal, and wherein, each X is independently a halide, $C_1$ to $C_{20}$ alkyl, aralkyl or hydrogen.