CLAIMS

The invention claimed is:

1. A method comprising:

polymerizing one or more monomers in the presence of a catalyst system in a loop reactor to produce a polyolefin product having a polydispersity index of 2.5 to 8, wherein the loop reactor comprises two or more reactors in series, and wherein the loop reactor has a loop thermal gradient of 50°C to 150°C.

2. The method of claim 1, wherein the one or more monomers comprises a first monomer selected from the group consisting of: ethylene, propylene, butene, pentene, hexene, heptene, octene, nonene, decene, dodecene, 4-methylpentene-1,3-methylpentene-1,3,5,5-trimethylhexene-1, and 5-ethylnonene-1.

3. The method of claim 2, wherein the one or more monomers further comprises a second monomer different than the first monomer and selected from the group consisting of: ethylene, propylene, butene, pentene, hexene, heptene, octene, nonene, decene, dodecene, 4-methylpentene-1,3-methylpentene-1,3,5,5-trimethylhexene-1, 5-ethylnonene-1, styrene, alpha-methylstyrene, para-alkylstyrenes, vinyltoluenes, vinylnaphthalene, allyl benzene, indene, 4-phenyl-butene-1, allylbenzene, vinylcyclohexane, vinylcyclohexene, vinylnorbornene, ethylidene norbornene, cyclopentadiene, cyclopentene, cyclohexene, cyclobutene, butadiene, pentadiene, hexadiene, heptadiene, octadiene, nonadiene, decadiene, undecadiene, dodecadiene, tridecadiene, tetradecadiene, pentadecadiene, hexadecadiene, heptadecadiene, octadecadiene, nonadecadiene, icosadiene, heneicosadiene, docosadiene, tricosadiene, tetracosadiene, pentacosadiene, hexacosadiene, heptacosadiene, octacosadiene, nonacosadiene, and triacontadiene.

4. The method of any one of claims 1-3, wherein the loop reactor comprises two to twenty reactors in series.

5. The method of any one of claims 1-4, further comprising:

introducing a feedstock comprising the one or more monomers at -10°C to 40°C.

6. The method of any one of claims 1-5, wherein the polydispersity index of the polyolefin product is 3 to 8.

7. A method comprising:

polymerizing one or more monomers in the presence of a catalyst system in a loop reactor to produce a polyolefin product having a polydispersity index of 2.5 to 8, wherein the loop reactor comprises two or more reactors in series, and wherein the loop reactor has a loop thermal gradient of 50°C to 150°C, and wherein the loop reactor has a standard deviation of inter-component thermal gradients along the loop reactor of 10°C to 50°C

8. The method of claim 1, wherein the polymerizing is a slurry polymerization process performed at 15 psi to 735 psi and 0°C to 120°C.

9. The method of any one of claims 1-7, wherein the polymerizing is a solution polymerization process performed at 120 psi to 1800 psi and 50°C to 220°C.

10. A method comprising:

polymerizing one or more monomers in the presence of a catalyst system in a loop reactor to produce a polyolefin product having a polydispersity index of 2.5 to 8, wherein the loop reactor comprises two or more reactors in series, and wherein the loop reactor has a standard deviation of inter-component thermal gradients along the loop reactor of 10°C to 50°C.

11. The method of claim 10, wherein the one or more monomers comprises a first monomer selected from the group consisting of: ethylene, propylene, butene, pentene, hexene, heptene, octene, nonene, decene, dodecene, 4-methylpentene-1,3-methylpentene-1,3,5,5-trimethylhexene-1, and 5-ethylnonene-1.

12. The method of claim 11, wherein the one or more monomers further comprises a second monomer different than the first monomer and selected from the group consisting of: ethylene, propylene, butene, pentene, hexene, heptene, octene, nonene, decene, dodecene, 4-methylpentene-1,3-methylpentene-1,3,5,5-trimethylhexene-1, 5-ethylnonene-1, styrene, alpha-methylstyrene, para-alkylstyrenes, vinyltoluenes, vinylnaphthalene, allyl benzene,

indene, 4-phenyl-butene-1, allylbenzene, vinylcyclohexane, vinylcyclohexene, vinylnorbornene, ethylidene norbornene, cyclopentadiene, cyclopentene, cyclohexene, cyclobutene, butadiene, pentadiene, hexadiene, heptadiene, octadiene, nonadiene, decadiene, undecadiene, dodecadiene, tridecadiene, tetradecadiene, pentadecadiene, hexadecadiene, heptadecadiene, octadecadiene, nonadecadiene, icosadiene, heneicosadiene, docosadiene, tricosadiene, tetracosadiene, pentacosadiene, hexacosadiene, heptacosadiene, octacosadiene, nonacosadiene, and triacontadiene.

13. The method of any one of claims 10-12, wherein the loop reactor comprises two to twenty reactors in series.

14. The method of any one of claims 10-13, further comprising:
introducing a feedstock comprising the one or more monomers at -10°C to 40°C.

15. The method of any one of claims 10-14, wherein the polydispersity index of the polyolefin product is 3 to 8.

16. The method of any one of claims 10-15, wherein the polymerizing is a slurry polymerization process performed at 15 psi to 735 psi and 0°C to 120°C.

17. The method of any one of claims 10-15, wherein the polymerizing is a solution polymerization process performed at 120 psi to 1800 psi and 50°C to 220°C.

18. The method of any one of claims 7-9, wherein the one or more monomers further comprises a second monomer different than the first monomer and selected from the group consisting of: styrene and paramethylstyrene.