CLAIMS

*What is claimed is:*

1. A method for solution polymerization, comprising:

forming a first mixture stream consisting essentially of at least one catalyst and a process solvent;

forming a second mixture stream consisting essentially of at least one activator and the process solvent;

feeding the first mixture stream and the second mixture stream separately to at least one reaction zone of a first loop reactor comprising one or more monomers dissolved in the process solvent;

polymerizing the at least one monomers within the at least one reaction zone in the presence of the catalyst, activator and process solvent; and

recovering the polymer.

2. The method of claim 1, wherein the first mixture stream consists essentially of the at least one catalyst, the process solvent, and one or more olefins.

3. The method of claim 1, wherein the second mixture stream consists essentially of the at least one activator, the process solvent, and one or more olefins.

4. The method of claim 1, wherein only one of the first mixture stream and the second mixture stream, but not both streams, further comprises one or more olefins.

5. The method of claim 1, wherein the reaction zone comprises at least one spiral heat exchanger disposed therein.

6. The method of claim 1, wherein the polymerizing comprises obtaining an effluent stream, and wherein recovering the polymer comprises separating the effluent stream into a product stream comprising the polymer that is substantially free of the solvent and a recycle stream comprising the process solvent and unreacted monomer.

7. The method of claim 1, wherein the monomer comprises one or more C2 to C40 olefins.

8. The method of claim 7, wherein the one or more C2 to C40 olefins are selected from the group consisting of ethylene, propylene, butene, pentene, hexene, heptene, octene, nonene, decene, undecene, and dodecene.

9. The method of claim 1, wherein the polymer comprises polyethylene, polypropylene, or a copolymer thereof.

10. The method of claim 1, wherein the polymer is an ethylene polymer or a propylene polymer, or a copolymer thereof.

11. The method of claim 1, wherein the polymer comprises one or more C2 to C20 comonomers.

12. The method of claim 11, wherein the one or more C2 to C20 comonomers are selected from the group consisting of ethylene, propylene, butene, pentene, hexene, heptene, octene, nonene, decene, undecene, and dodecene.

13. A method for solution polymerization, comprising:

forming a first mixture stream consisting essentially of at least one catalyst and a process solvent;

forming a second mixture stream consisting essentially of at least one activator and the process solvent;

feeding the first mixture stream and the second mixture stream separately to at least one reaction zone comprising one or more monomers dissolved in the process solvent;

polymerizing the at least one monomers within the at least one reaction zone in the presence of the catalyst, activator and process solvent to obtain a first effluent stream comprising a solution of polymer dissolved in the process solvent;

cooling the first effluent stream in at least one spiral heat exchanger to produce a second effluent stream, wherein the first effluent stream flows through the at least one spiral heat exchanger in a cross-flow direction relative to spirals of the at least one spiral heat exchanger; and

recovering the polymer.

14. The method of claim 13, wherein recovering the polymer comprises separating the second effluent stream into a product stream comprising the polymer that is substantially free of the solvent and a recycle stream comprising the process solvent and unreacted monomer.

15. The method of claim 13, wherein the first mixture stream consists essentially of the at least one catalyst, the process solvent, and one or more olefins, and wherein the second mixture stream consists essentially of the at least one activator, the process solvent, and one or more olefins.

16. The method of claim 13, wherein only one of the first mixture stream and the second mixture stream, but not both streams, further comprises one or more olefins.

17. The method of claim 13, wherein the polymer is an ethylene polymer or a propylene polymer, or a blend thereof, and the polymer comprises one or more C2 to C20 selected from the group consisting of ethylene, propylene, butene, pentene, hexene, heptene, octene, nonene, decene, undecene, and dodecene.

18. A method for solution polymerization, comprising:

apportioning a reactant feed comprising one or more monomers, process solvent, and optionally one or more comonomers into a first substream, a second substream, a first slip stream and a second slip stream;

forming a first mixture stream consisting essentially of at least one catalyst and the first substream;

forming a second mixture stream consisting essentially of at least one activator and the second substream;

mixing the first mixture stream with the first slip stream;

mixing the second mixture stream with the second slip stream;

feeding the resulting first mixture stream and the resulting second mixture stream separately to at least one reaction zone;

polymerizing the at least one monomers and optional one or more comonomers within the at least one reaction zone in the presence of the catalyst, activator and process solvent; and

recovering the polymer.

19. The method of claim 18, wherein the first slip stream is less than 10 wt% of the first substream and the second slip stream is less than 10 wt% of the second substream.