CLAIMS

1. A process to obtain a real-time measurement of a monomer concentration and/or a real-time measurement of a comonomer concentration in at least one process stream of a solution polymerization to form a polymer, said process comprising analyzing the amount of the monomer and/or the amount of the comonomer in a polymer solution downstream from the exit of at least one reactor, using at least one fiber optic sensor coupled to a light source, or using at least one flow cell coupled to a light source, and wherein the light source is connected to a spectrometer; and wherein at least one of the following takes place:

A) a portion of the polymer solution exits the reactor, and then comes into contact with the fiber optic sensor or the flow cell, and a spectrum is generated, and then the solution flows through a densitometer; or

B) a portion of the polymer solution exits the reactor, and then flows through a densitometer, and then the solution comes into contact with the fiber optic sensor or the flow cell, and a spectrum is generated; or

C) a portion of the polymer solution exits the reactor, and is split into at least two streams, and wherein one stream flows through a densitometer, and wherein another stream comes into contact with the fiber optic sensor or flow cell, and a spectrum is generated; and

wherein the process further comprises analyzing the amount of a monomer and/or the amount of a comonomer, in a recycled solvent stream, using at least one fiber optic sensor coupled to a light source, or using at least one flow cell coupled to a light source; and wherein this recycled solvent stream is downstream from a "solvent/monomer separator" and upstream from the injection of the monomer and/or the comonomer into a process stream fed to the at least one reactor.

2. The process of claim 1, wherein the "polymer solution downstream from the exit of at least one reactor," which is analyzed, comprises from 6 to 50 wt% of the polymer, based on the weight of the polymer solution.

3. The process of claim 1 or claim 2, wherein the densitometer is upstream from a separator.

4. The process of claim 3, wherein the fiber optic sensor or the flow cell is upstream from the separator.

5. The process of any one of the previous claims, wherein the analysis of “the amount of monomer and/or comonomer in the polymer solution downstream from the exit of the at least one reactor” is performed using an equipment that comprises a spectrometer selected from an FTIR spectrometer or an FTNIR spectrometer.

6. The process of any one of the previous claims, further comprising analyzing the amount of a monomer and/or the amount of a comonomer in a process stream, upstream from the entrance into the at least one reactor, using at least one fiber optic sensor coupled to a light source, or using at least one flow cell coupled to a light source; and wherein “the amount of the monomer and/or the amount of the comonomer” in this process stream derives from fresh monomer and/or fresh comonomer, respectively, and optionally from recycled monomer and/or recycled comonomer, respectively.

7. The process of any one of the previous claims, wherein the polymer is an olefin-based polymer.

8. A solution polymerization process to form a polymer, said process comprising at least the following steps:

a) feeding monomer, solvent, and comonomer(s) to at least one reactor;

b) dissolving monomer, and comonomer(s), in the solvent, to form a solution;

c) polymerizing the monomer and comonomer to form the polymer; and

d) measuring one or more of monomer concentration and comonomer concentration, using the process of any one of the previous claims;

e) sending the measured information to a control system, and

f) adjusting reactor conditions via the control system if one or more of monomer concentration and comonomer concentration deviate from desired limits.

9. The solution polymerization process of claim 8, wherein monomer flow rate, comonomer flow rate, or both are adjusted if measured comonomer to monomer ratio deviates from comonomer to monomer ratio target.

10. A polymerization apparatus comprising at least the following:

i) at least one reactor;

ii) at least one fiber optic sensor coupled to a light source, or at least one flow cell coupled to a light source;

iii) at least one densitometer;

iv) at least one spectrometer connected to the light source;

v) a solvent/monomer separator; and

wherein (a) at least one fiber optic sensor coupled to a light source or at least one flow cell coupled to a light source and at least one spectrometer connected to the light source are located downstream from an exit of at least one reactor and (b) wherein at least one densitometer is located downstream from the at least one fiber optic sensor coupled to a light source or the at least one flow cell coupled to a light source and the at least one spectrometer connected to the light source, and wherein (a) and (b) are in a series configuration, a portion of the polymer solution exits the reactor, then comes into contact with the fiber optic sensor or the flow cell, and a spectrum is generated, and then the solution flows through a densitometer; or

wherein (a1) at least one densitometer is located downstream from an exit of at least one reactor and (b1) wherein at least one fiber optic sensor coupled to a light source or at least one flow cell coupled to a light source and at least one spectrometer connected to the light source is located downstream from the at least one densitometer, and wherein (a1) and (b1) are in a series configuration, a portion of the polymer solution exits the reactor, then flows through a densitometer, and then the solution comes into contact with the fiber optic sensor or the flow cell, and a spectrum is generated; or

wherein (a2) at least one fiber optic sensor coupled to a light source or at least one flow cell coupled to a light source and at least one spectrometer connected to the light source and (b2) a densitometer, are located downstream from an exit of at least one reactor, and

wherein (a2) and (b2) are in a parallel configuration, a portion of the polymer solution exits the reactor, and is split onto at least two streams, and wherein one stream flows through a densitometer, and wherein another stream comes into contact with the fiber optic sensor or flow cell, and a spectrum is generated; and

wherein at least one fiber optic sensor coupled to a light source or at least one flow cell

coupled to a light source is located downstream from a solvent/monomer separator and

located upstream from the location where injection of monomer and/or comonomer into a process stream fed to the at least one reactor takes place.