SUMMARY

A method to reduce the co-crystallization Index (CI) in a chromatogram generated by a temperature gradient chromatography, said method comprising the following:

a) dissolving a composition comprising at least one polymer in at least one solvent, to form a polymer solution;

b) injecting at least a portion of the polymer solution onto a support material and wherein the support material has a CI from 0.70 to 1.50;

c) cooling the support material at a rate greater than, or equal to, 0.2°C/min;

d) increasing the temperature of the support material to elute at least some of the polymer;

e) generating the chromatogram.

In one aspect, there is provided a method to analyze a polymer solution using a temperature gradient chromato-graphy, said method comprising the following:

a) dissolving a composition comprising at least one polymer in at least one solvent, to form the polymer solution;

b) injecting at least a portion of the polymer solution onto a support material and wherein the support material has a Co-Crystallization Index (CI) from 0.70 to 1.50;

c) cooling the support material at a rate greater than, or equal to, 0.2°C/min;

d) increasing the temperature of the support material to elute at least some of the polymer;

e) generating a chromatogram.

In another aspect, there is provided an apparatus is provided for polymer chromatography, comprising at least one column that comprises a support material, and wherein the support material has a Co-Crystallization Index (CI) from 0.70 to 1.50**,** and wherein the support material comprises an inert material.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 depicts a schematic drawing of the set up for the inventive analysis.

Figure 2 is a TREF chromatogram of DOWLEX 2056A, which is noted for the calculation of A_I.

Figure 3 is a TREF chromatogram of DOWLEX 2056A, which is noted for the calculation of A_0.

Figure 4 is an overlay of a SCBD distribution (CEF) of DOWLEX 2056A, using an inventive analysis and a comparative analysis.

Figure 5 is an overlay of a SCBD distribution (TREF) of DOWLEX 2056A, using an inventive analysis and a comparative analysis.

CLAIMS:

1. A method to analyze a polymer solution using a temperature gradient chromatography, said method comprising the following:

a) dissolving a composition comprising at least one polymer in at least one solvent, to form the polymer solution;

b) injecting at least a portion of the polymer solution onto a support material and wherein the support material has a Co-Crystallization Index (CI) from 0.70 to 1.50;

c) cooling the support material at a rate greater than, or equal to, 0.2°C/min;

d) increasing the temperature of the support material to elute at least some of the polymer;

e) generating a chromatogram.

2. The method of claim 1, wherein the temperature gradient chromatography is selected from the following: i) a crystallization elution fractionation (CEF) chromatography, or ii) a temperature rising elution fractionation (TREF) chromatography.

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

4. The method of any one of the previous claims, wherein the support material comprises spherical particles that have D50 value less than, or equal to, 100 microns.

5. The method of any one of the previous claims, wherein the durability of the support material meets the following equation: $H_I = mx + B$, where $m < 0.007$, and wherein the equation has a linear regression correlation coefficient $R2 \leq 0.25$; and wherein x = number of the consecutive injection of a reference material, and wherein x is from 1 to 40; and for each x value, $H_I = \frac{\int_{T_V}^{upper\ intergration\ limit} dW_f/dT * dT}{\int_{T_{SF}}^{upper\ intergration\ limit} dW_f/dT * dT} * 100\%$.

6. The method of any one of the previous claims, wherein the support material comprises gold coated nickel particles.

7. An apparatus for polymer chromatography, comprising at least one column that comprises a support material, and wherein the support material has a Co-Crystallization Index (CI) from 0.70 to 1.50**,** and wherein the support material comprises an inert material.

8. The apparatus of claim 7, wherein the support material comprises gold coated nickel particles.

9. The apparatus of claim 7 or claim 8, wherein the durability of the support material meets the following equation: $H_I = mx + B$, where $m < 0.007$, and wherein the equation has a linear regression correlation coefficient $R2 \leq 0.25$; and wherein x = number of the consecutive injection of a reference material, and wherein x is from 1 to 40; and, for each x value,

$$H_{\mathrm{I}} = \frac{\int_{T_{\mathrm{V}}}^{upper\ intergration\ limit} dW_{\mathrm{f}}/dT{*}\mathrm{dT}}{\int_{T_{\mathrm{SF}}}^{upper\ intergration\ limit} dW_{\mathrm{f}}/dT{*}\mathrm{dT}} {*}100\%.$$