

TREF

TEMPERATURE RISING ELUTION FRACTIONATION



Full automation of the classical technique for the characterization of the Chemical Composition Distribution in Polyolefins.

Temperature Rising Elution Fractionation has been the most comprehensive technique for the characterization of the Chemical Composition Distribution (CCD) in polyolefins, and Polymer Char's TREF is the first fully automated apparatus implementing this technique.

The virtual instrumentation software controls the full process, so no manpower intervention is required. Samples are put into the vessels and the instrument performs the dissolution, column loading, and temperature cycles combined with pump flow control. At the end, vessels and lines are cleaned and the TREF equipment is ready to analyze more samples.

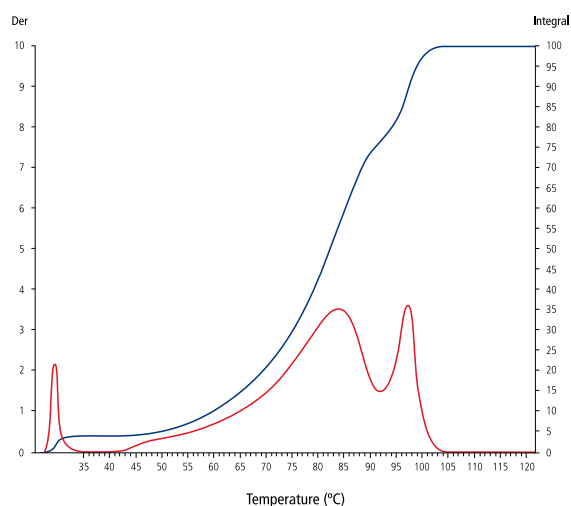
The concentration of the sample is measured by an infrared detector (Polymer Char's IR4), which can also offer information about comonomer content if a composition sensor is added. More information can be obtained by adding Viscometer and/or Light Scattering detectors.

TREF can be converted into a CRYSTAF-TREF combined system capable of running both techniques by using the same hardware. Each technique can provide complementary information on the CCD in some complex resins.

Find out more at www.polymerchar.com/TREF

KEY POINTS

- ▶ Full automation of the TREF techniques to measure the CCD:
 - ▶ No manpower intervention required.
 - ▶ No solvents handling.
 - ▶ Low consumption of solvent.
 - ▶ Automated cleaning at the end of the analysis.
- ▶ 5 samples can be analyzed sequentially with no supervision required, with an analysis time of 6 hours per sample.
- ▶ Possibility of adding other detectors like Viscometer or Light Scattering.
- ▶ Easy convertible into a CRYSTAF-TREF apparatus.
- ▶ Possibility of subambient operation (down to -20°C) for low crystallinity samples.



TREF analysis of a bimodal LLDPE resin.

Solutions for Polyolefin Characterization

CRYSTAF: An instrument designed for intensive use in the analysis of the Chemical Composition Distribution in Polyolefins.

TREF: A completely automated apparatus for the analysis of the Chemical Composition Distribution in Polyolefins. It provides complementary information to CRYSTAF data in the analysis of some complex resins.

CRYSTAF-TREF: CRYSTAF and TREF techniques are available in the same equipment for a full Chemical Composition Distribution characterization.

CEF: A high throughput equipment to analyze the Chemical Composition Distribution in Polyolefins, using a new approach combining CRYSTAF and TREF separation mechanisms.

PREP mc²: An automated instrument to perform semipreparative fractionation according to composition by TREF or CRYSTAF, or molar mass.

PREP C20: New column-based preparative fractionation instrument, capable to fractionate up to 20 grams of polymer.

CRYSTEX[®] QC: A truly automated system based on TREF-separation concept for soluble fraction measurement, ethylene content and intrinsic viscosity in PP/PE plants control.

CRYSTEX[®] 42: A high-throughput and easy-to-use system for simultaneous measurement of the soluble fraction, ethylene content and intrinsic viscosity in a fully automated process for up to 42 samples.

IVA: Reliable and automated instrument for Intrinsic Viscosity Analysis of polymers with dissolution temperature up to 200°C.

GPC-IR[®]: Advanced High Temperature GPC for the analysis of Molar Mass Distribution in Polyolefins. Fully automated sample preparation and filtration. Triple detector (IR, VS, LS) plus composition.

GPC-QC: High Temperature GPC instrument for Quality and Process Control in Polyolefin production plants.

CFC: A fully automated Cross Fractionation Chromatograph (TREFxGPC or TGICxGPC) for the analysis of Bivariate distribution.

GPC One[®] Software: The most comprehensive GPC/SEC Calculations Software integrating all detectors' signals.

Data Unit 200: Versatile signals acquisition device to link any vendor GPC instrument with Polymer Char's GPC One[®].

TGIC: An adsorption high temperature HPLC technique for the analysis of low crystallinity Polyolefins.

SGIC 2D: An adsorption high temperature HPLC technique combined with GPC and infrared detection for the analysis of composition and molar mass interdependence of Polyolefin resins.

IR4: Integrated, reliable and simple to use infrared (IR) detector to measure concentration and composition.

IR5 MCT: Integrated and modern IR detector with an MCT element (thermoelectrically cooled) for high sensitivity analysis.

Analytical Services: Polymer Char laboratory, a global reference in the field, counts on the latest technologies for Polyolefin Characterization.

Company Profile

Polymer Char is devoted to the development of state-of-the-art instrumentation for Polyolefin Analysis.

The company offers the broadest and most modern range of instruments and services for polymer analysis and more specifically, for the structural characterization of Polyolefins, such as Molar Mass Distribution (GPC-IR[®], GPC-QC, GPC One[®]), Chemical Composition Distribution (CRYSTAF, TREF, CEF), Bivariate Distribution by Cross-Fractionation Chromatography (CFC), High Temperature HPLC (TGIC, SGIC 2D), Soluble Fraction Determination (CRYSTEX[®], CRYSTEX[®] QC and CRYSTEX[®] 42), Preparative Fractionation (PREP mc², PREP C20), Intrinsic Viscosity (IVA) or integrated Infrared Detection (IR4, IR5 MCT).

Polymer Char is also well known for its advanced approach to virtual instrumentation software that, together with excellent remote control capabilities and its strong commitment to Customer success, places the company at the leading edge on instrumentation diagnostics and technical support.

Together with its global network of partners and distributors, Polymer Char supplies, trains and supports Customers worldwide. The company provides analytical services in 35 countries and its instruments are present today in over 20 countries within the Americas, Europe, Africa, Middle East and Asia Pacific, predominantly serving Polymer Producers and Processors, Government and Academic Research Laboratories, Contract Research Organizations, Analytical and Testing Laboratories, and Chemical Instrumentation Manufacturers.

In the last two decades and with an annual investment of up to 20% of its manpower resources on R&D, Polymer Char has played a key role in the development of most of the existing Polyolefin analysis technologies, such as CRYSTAF, CRYSTEX[®], CEF, CFC, and GPC with IR detection. Each new project, each new analysis, underpins Polymer Char as the Polyolefin Characterization Company.



IMPIVA



EUROPEAN UNION
European Regional
Development Funds

Several Polymer Char's R&D projects have counted on the financial support of IMPIVA, the Spain's Ministries of Science and Innovation and of Industry and Trade; and the European Union, with its Funds for Regional Development within the FEDER operational program of the Valencian Community 2007-2013.