

# 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.

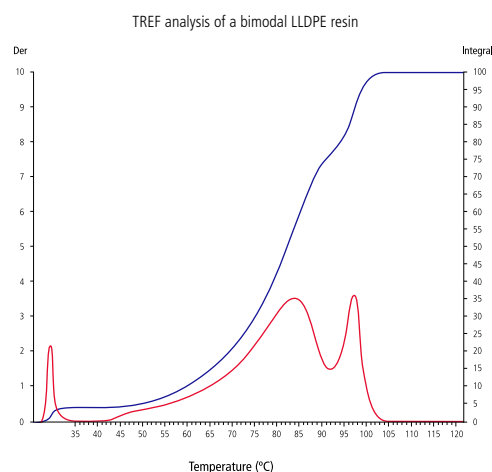
The virtual instrumentation software controls the full process, so no manpower intervention is required. Samples are put into the vessels and the instrument performs the dissolution, column loading, and temperature cycles combined with pump flow control. At the end, vessels and lines are cleaned and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

## KEY POINTS

- ▶ Full automation of the TREF technique to measure the CCD:
  - ▶ No manpower intervention required.
  - ▶ No solvents handling.
  - ▶ Low solvent consumption.
  - ▶ 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.
- ▶ Easily convertible into a CRYSTAF-TREF apparatus.
- ▶ Possibility of subambient operation (down to -20°C) for low crystallinity samples.



## The broadest range of instruments 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 by TREF. 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.
- **CRYSTAF QC**: a simple and robust apparatus for the precise and fast analysis of the Chemical Composition Distribution in a Quality Control environment.
- **CEF**: a high throughput equipment to analyze the Chemical Composition Distribution in polyolefins, using a new approach which combines CRYSTAF and TREF separation mechanisms.
- **CFC**: a fully automated Cross Fractionation Chromatograph (TREF+GPC) for the analysis of the Bivariate distribution in Polyolefins.
- **CRYSTEX**: an apparatus specially designed for the analysis of Xylene Solubles in polypropylene in a Quality Control environment with no solvents handling.
- **GPC<sub>IR</sub>**: a new High Temperature GPC for the analysis of MWD in Polyolefins. Fully automated sample preparation and filtration. Triple detector+composition.
- **GPC One Software**: the most comprehensive GPC Calculations Software available in the market integrating all detectors signals in the same package.
- **Data Unit 200**: Versatile signals acquisition device to link any vendor GPC instrument with Polymer Char's GPC acquisition and calculations unit.
- **PREP mc<sup>2</sup>**: an automated instrument to perform semipreparative fractionation of polymers according to composition or molar mass.
- **IR4**: a reliable IR detector that can work with up to four simultaneous wavelengths to measure concentration and composition.
- **IR5 MCT**: a modern IR detector with a sensitive MCT element (thermoelectrically cooled) for the analysis of low number of branches in HDPE pipe resins by GPC<sub>IR</sub>.
- **Additional Detectors**: in some of its instruments Polymer Char offers Light Scattering (DAWN<sup>®</sup> HELEOS<sup>™</sup> II of Wyatt Technology), Viscometry and Composition (by Polymer Char) to perform Triple Detector+Composition analysis.

### Company Profile

Polymer Char, the world's leading Polyolefin Characterization Company, is devoted to the development of state-of-the-art instrumentation for Polyolefin Analysis.

Polymer Char goes as far as Polyolefin Analysis techniques and Engineering Technology and advancement is concerned, with the broadest and most modern range of products for Polymer Analysis and more specifically, for Structural Characterization of Polyolefins, such as Chemical Composition Distribution (CCD), Molar Mass Distribution (GPC/SEC), Bivariate Distribution, Xylene Solubles, Preparative Fractionation or Infrared Detection.

The company is well known also by its advanced approach into virtual instrumentation software, that together with excellent Remote Control capabilities and its strong commitment to Customer success, places the company in the leading edge on instrumentation Diagnostics and Technical Support.

Polymer Char was formed as Polymer Characterization, S.A. in 1992 at the Valencia Technology Park in Spain with the initial goal to develop a commercial CRYSTAF instrument. Now, after almost two decades in the Polyolefin Characterization industry, backed with unmatched technical expertise and insights, Polymer Char maintains the highest levels of Quality and Service that go with the needs of the Petrochemical, Research and Academic industries.

Today, Polymer Char provides to the leading Petrochemical firms, as well as to prestigious R&D Institutes and Universities from all around the world. Its instruments are present in over 20 countries, within the Americas, Europe, Africa, Middle East and Asia.

Polymer Char's knowledge investments are backed by years of R&D and have led to the creation of state-of-the-art Polyolefin lab in Valencia in 2008 from where the company supplies Analytical Services in over 30 countries.



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