

# Dedication to Polyolefins

**T**he Spanish-based maker of test instruments for polyolefins, Polymer Characterization S.A. ([www.polymer-char.com](http://www.polymer-char.com)), is extending its product range beyond its original instruments for large resin producers' analytical labs. Polymer Char (pronounced 'car') will shortly introduce its first smaller instruments designed specifically for processors' and resin producers' quality control labs. *Plastics Engineering* asked the company's founder and director of R&D, Dr. Benjamin Monrabal, to explain some of the unusual technologies the company has developed.

**PE:** What polyolefin test equipment does Polymer Char build that no one else offers?

**Monrabal:** Most of our instruments (except GPC), we are the only provider of. Our CEF (Crystallization Elution Fractionation) instrument developed in 2005, for example, combines fast chemical composition distribution analysis (called CRYSTAF) and traditional solution-based CCD testing (called TREF).

**PE:** Why would you combine two chemical composition distribution tests?

**Monrabal:** Complex PP/PE copolymers require both. For example, TREF alone can't distinguish a combination of HDPE and EP copolymer, while CRYSTAF alone can't analyze a combination of HDPE and Ziegler-type PP homopolymer. Polyolefins are getting more complicated all the time.

**PE:** Polymer Char often collaborates with its customers to develop custom instruments, which later become commercial. What's the most unusual of these?

**Monrabal:** Probably our most unusual collaboration was with Mitsubishi Chemical in Japan. Mitsubishi had successfully commercialized a combined TREF and GPC/SEC instrument, but wanted to leave the test instrument market. We partnered to develop a modern, fully automated version of their instrument, known as CFC (Cross Fractionation Chromatograph).

**PE:** Do you get more information by testing composition distribution and GPC molar mass together than

by testing each separately?

**Monrabal:** Absolutely, because the combination also provides the interdependence between composition and molar mass. Not every resin needs this, however. For homopolymer PP or PE, GPC alone is enough, and for simple PE/PP copolymers CCD alone may be enough. CFC testing provides the full picture of more complex resins.

**PE:** How detailed are Polymer Char's tests for polyolefin chain branching?

**Monrabal:** Long chain branching is measured much the same by all GPC instruments, using a triple detector (concentration, viscosity and light scattering). What's



unique about our GPC is that we add a fourth detector (IR4), dual-wave-length IR, which can measure short chain branching and functional groups in polyolefin copolymers along the molar mass distribution. We also developed an even more sensitive IR5 MCT (mercury cadmium telluride) detector to analyze very low levels of branching in HDPE pipe resins.

**PE:** You worked for many years in Dow Chemical's polymer lab before starting your own instrument company. How did that experience impact your instrument designs?

**Monrabal:** The GPC systems that I used in the past were difficult to maintain. They also required handling dangerous solvents. We tried to design test instruments that are both reliable and fully automated. We make the only polyolefin analysis instruments where the user never has to load

solvents manually into a vial or change vials externally.

**PE:** Your instruments are very specialized, yet your GPC One data collection unit accepts data from competing GPC instruments as well as your own. Why is that?

**Monrabal:** We collaborated for over two years with recognized polyolefin scientists to improve on what existing data processing software provided. They wanted to be able to import all detector signals to provide a single multi-detector GPC response. Ours is the only package that does. Users can also implement their own calculation algorithms if they want to. Our stand-alone IR4 detector can also be added to a competing GPC instrument with our GPC One data package.

**PE:** What about processors and recyclers, who don't need such sophisticated test equipment. Does

Polymer Char have any instruments for them?

**Monrabal:** By the end of the year we will commercialize several new instruments specifically for quality control laboratories. The instruments are simple and reliable and will provide fast analytical results for intrinsic viscosity, CCD measurement, and Xylene solubles measurement.

**PE:** What about situations where a processor wants to test an occasional competing product or resin sample picked up at a trade show with one of your test instruments?

**Monrabal:** We always provided test services to resin companies. Some polymer analytical labs also subcontract tests to us. Now that we have just completed a large new test laboratory in Valencia, we are beginning to offer analytical and test services to processors too, who can also benefit from the information.

**PE:** How can processors learn more about polyolefin characterization testing in general?

**Monrabal:** We co-organize the International Conference on Polyolefin Characterization every two years. The next one is in Houston late next year ([www.icpc-conference.org](http://www.icpc-conference.org)) and will include a Short Course in Polyolefins Characterization Techniques. It's not just for resin companies and universities. It can help processors understand the microstructures of the resins they use and result in downgauging or improving product performance.

When Polymer Char recently opened a large new laboratory in Spain, it began to offer resin test services to plastics processors for the first time, a service it had previously provided to resin producers for many years.

