Case study

Measuring polymer material properties with Raman spectroscopy

Company overview

The Chemours Company
Headquarters: Wilmington, DE
Industry: Chemicals

"Raman spectroscopy is a well-established technique that complements everything else in the testing lab"

Background

Chemours, a Wilmington, Delaware-based chemical company, produces materials that help firms solve challenging problems related to polymers, pigments and cooling fluids. The company continually develops new polymer materials and new applications for existing materials. This requires measuring properties of the materials to ensure proper function.

Consequently, during production the company measures its process to maintain tight control, according to Troy Francisco, technology manager, Chemours Discovery Hub, and team leader for the leveraged analytical group and the process analysis group.

“Raman spectroscopy is a well-established technique that complements everything else in the testing lab,” said Francisco. “It is vital for any application related to the compositional analysis of polymers, which is important at Chemours. We also find that its useful for the compositional analysis of reactants going into a chemical reaction.”

“The technology is also very good at telling us what the different forms or purity levels are in inorganic, solid state or mineral type materials, and can help to identify impurities in those materials,” he adds.

Challenge

In 2021, Chemours was searching for a new Raman spectroscopy system to complement other analytical measurement technologies in their testing laboratory. The company previously had experience with two separate Raman spectroscopy systems. Francisco describes one as a “a low end, qualitative type system” that did not have great stability in terms of response or signal, nor great stability with respect to the wavelength access or its registration.

“[The low-end system] was useful for rough measurements, but was not a high fidelity, scientific instrument,” said Francisco.

The other system that Chemours utilized was a high-quality R&D level instrument, but it required considerable attention and frequent calibration. Francisco found it difficult to keep up with the maintenance required for the Chemours applications.

In addition, the system was quite costly “so we not only had to work more, but also had to pay more,” said Francisco.

Solution

For many years, Raman spectroscopy has had a reputation for being expensive, cumbersome and difficult to use. Advancements in stability, portability and technological improvements in lasers, optics, and detectors have made the technique faster and more accessible for real-time inline measurements as well as laboratory testing.

The Thermo Scientific™ Ramina™ Process Analyzer produces identical and repeatable results from unit to unit with a small footprint. Common chemometric mathematical models can be applied across systems to produce consistent results.

“When we recently needed to upgrade our Raman spectroscopy technology, I saw that Thermo Fisher Scientific equipment really fit our requirements in terms of size, stability, application and ease of use,” said Francisco.

Benefits

According to Francisco, the Ramina Process Analyzer provides an unusual combination of compactness with stability.

"The small package works beautifully, and the computing front end includes everything we need," Francisco said.

The Ramina Process Analyzer works with a wide array of contact probes suitable for compositional analysis applications that can be changed in seconds, without the need for recalibration. Thermo Fisher Scientific manufactures a wide range of standard and custom probes to measure compounds, including in solids, liquids, gases, slurries, pastes, and gels.

“The probes are the only component that touches or interacts with the sample itself, so we have purchased the BallProbe®, Proximal BallProbe® and FlowCell™ to ensure we have all the options in our toolbox,” said Francisco.

> “When we received our [Raman spectroscopy] system, we unpacked the box and were collecting Raman measurements within 10 to 15 minutes. I have never seen that before with a Raman system. The level of simplicity and accessibility is unheard of with this type of equipment,”
>
> - Troy Francisco

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