

### **POLYMER ANALYSIS**

# PUZZLED ABOUT YOUR POLYMERS?

Typically organic, polymers are chemical compounds that consist of chains of repeating monomer compounds/ units. Used in diverse products ranging from furniture to pharmaceuticals to food packaging, the applications for polymers are endless..

When you need answers about the polymers in your products, Industrial Inspection & Analysis (IIA) can help.

Our lab experts provide detailed data about the chemical and physical properties of polymers — information that can aid in quality control and product improvement. Our polymer analyses provide insight into molecular structure, weight percent, density, thermal characteristics, hardness and more.



#### **APPLICATIONS FOR POLYMER ANALYSIS**

Here are just a few ways polymer analysis might be useful to your company:

- What to improve quality control or enhance the performance of your polymer product?
- Want to reverse engineer a formula so you can move foreign-based manufacturing back to the U.S.?
- Need a precise breakdown of an existing polymeric formula to meet a customer or regulatory request?
- Need to understand the root cause of a product failure?
- · Need to certify a polymer to an ASTM standard?

We've got you covered! Our Lab Services team can deliver the answers you need about the composition and limits of your polymer.

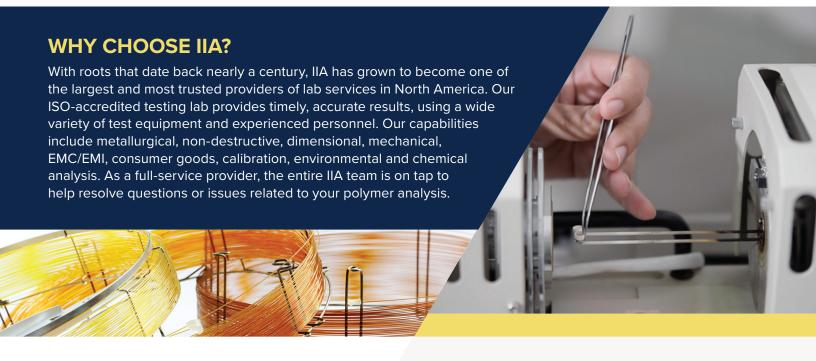


#### **OUR CAPABILITIES**

Compositional Analysis: This test is used to determine the chemical composition of any polymeric material. We provide a complete deformulation to identify and quantify the base polymer, as well as any organic and inorganic additives. We will discover if a polymer is contaminated with a different polymer, has the wrong additive, or has been recycled. Our comparative analyses provide useful data for reverse engineering and quality control.

Wear Testing: This type of testing assesses a polymeric material's ability to withstand repeated loading conditions, such as pressure, expansion/compression, vibration or temperature to ensure it will perform as intended over the course of its lifetime. Through wear testing, we can establish the limits of your polymer — the point at which structural integrity begins to decline — and quantify the rate and level of degradation. A controlled failure in a laboratory setting can provide a wealth of valuable information to position your product for success.

Failure Analysis: This type of analysis answers the "why" question when a polymeric material does not perform as intended or designed. With our highly accurate failure analysis, IIA compares samples from a high-performing polymer product to a non- or underperforming specimen to unravel the root cause of failures.



#### **INSTRUMENTATION & TYPES OF DATA DELIVERED**

#### Pyrolysis Gas Chromatography (Py/GC)

- · Polymer & Additive Identification
- Polymer & Additive Degradation Times [Evolved Gas Analysis (EGA)]
- Product Comparison

#### **Differential Scanning Calorimetry (DSC)**

- · Enthalpy (Melting Point)
  - enthalpy of melting
- Enthalpy (Crystallinity Temperature)
  - enthalpy of crystallinity
- · Glass Transition Temperature
- · Morphology Information (Preliminary)
- Oxidative Induction Time (Time between melting point and onset of degradation)

#### Thermogravimetric Analysis (TGA)

- Plasticizer Content
- · Polymer Content
- · Carbon Black
- Ash
- Thermal Stability (Determines temperature at which a component starts to break down)

#### **Energy-Dispersive X-Ray Spectroscopy (EDS)**

· Elemental Analysis

#### Scanning Electron Microscope (SEM)

Surface Analysis

#### Infrared (IR) Spectroscopy

Structural Information

## OTHER POLYMER TESTING SERVICES

- Density
- Hardness
  - Shore A (for rubbers)
  - Shore D (for plastics)
- · % Moisture
- Tensile Strength
- IZOD Impact Test
- Flammability
- · Dielectric Constants
- Solubility
- · Thermal Behavior
  - Thermoplastic vs. Thermoset
- · Linear or Branched vs Cross-linked
- Litmus Tests of Vapors from Plastics
- · Impact Resistance

