



Ebatco Nano

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Nano Brief

Ebatco will be exhibiting at the following upcoming events:

- October 2nd – 4th, BioInterface Workshop & Symposium, Catamaran Resort, San Diego, CA
- October 9th – 12th, Materials Science & Technology 2017, David L. Lawrence Convention Center, Pittsburgh, PA
- November 5th – 9th, International Symposium for Testing and Failure Analysis 2017, Pasadena Convention Center, Pasadena, CA

Please stop by our booth to discuss the incredible world of nanomaterials, nanodevices, nanoinstruments, and nano/micro scale surface characterization with our staff scientists. We hope to see you there!

Ebatco

We want to take the time to express our gratitude and thankfulness for the overwhelming support we received at our 10th Anniversary celebration! We were so glad to have this opportunity to share in this celebration with our friends, family, clients, and local community. We're so excited we could give the guests more information on Ebatco, as well as the testing capabilities that we have on site!

The Luncheon and Open House events were huge successes – bringing together a record number of participants from industries including, but not limited to, medical devices, chemicals, electronics, pharmaceuticals, and aerospace. We are proud to be a service provider to such a wide range of clients and hope that Ebatco can be a complimentary service to your team in the future! If you missed out on the Open House, feel free to reach out for a private tour and we will do our best to accommodate your schedule.

We are also excited to announce that we have launched a new version of our website! The new sleek design is extremely user-friendly and provides a lot of information about our business, our capabilities, and products we sell. Keep up to date with our recent news, see upcoming events on our calendar, and request quotes with ease! Check it out at <http://www.ebatco.com>. There are links to all of our social media accounts so follow to keep up with what's going on at Ebatco!

Case Study

Differential Scanning Calorimetry (DSC) is a powerful technique for measuring the thermal properties of materials, and is a popular tool for determining the percentage of crystallinity for polymers. A material's crystallinity is vital in predicting bulk physical properties including brittleness, toughness, modulus, optical properties, and more. In the case of plastic waste bags, it is especially important to understand the degree of crystallinity to ascertain how well the product will hold up to the increasing demands of waste management. Disposal bags need to be strong enough to resist tears and punctures that could cause leaks, but also require enough flexibility to stretch around lids and conform to their contents.

The Nano Analytical Testing Laboratory at Ebatco is equipped with a Netzsch STA 449 F3 Jupiter thermal analyzer. With variable furnaces, high sensitivity sensors, and simultaneous TGA capabilities, this instrument is designed to deliver accurate results in determining thermal properties including the degree of crystallinity.

Table 1 Test Conditions for Determining the Degree of Crystallinity of Polyethylene Waste Bags

Starting Temperature	Room temperature
Heating Rate	10 °C/min
Final Temperature	200 °C
Purge Gas	30 ml/min N ₂

To determine the degree of crystallinity, a baseline test was run to remove any influence from changes in the reference pan during heating before a small sample from a commercial polyethylene waste bag was placed within an aluminum crucible. The sample was heated from room temperature up to 200 °C at a constant rate of 10 °C/min, as described in Table 1.

After running the analysis, endotherms of heat flow versus temperature were observed. The enthalpy of melting ΔH_m was calculated by integrating the area beneath the peak corresponding to its phase transition. The degree of crystallinity can be calculated by comparing the ratio of the observed heat of melting to the heat of melting of a 100% crystalline reference sample, ΔH_m° . If a recrystallization peak is present during the heating scan, it also may be necessary to subtract the associated enthalpy ΔH_c from the observed heat of melting to isolate the crystalline components present in the original sample. The resulting equation for determining the degree of crystallinity is presented here:

$$DoC = \frac{\Delta H_m - \Delta H_c}{\Delta H_m^\circ} * 100\%$$

As can be seen in Figure 1, the enthalpy of melting for the waste bag was observed to be 164.4 J/g. No appreciable peaks corresponding to recrystallization were observed in the test sample. The theoretical enthalpy of melting for 100% crystalline polyethylene is known from the literature to be 293.4 J/g. By substituting the values into the above equation, a degree of crystallinity of approximately 56.03% was calculated for the commercial waste bag tested in this experiment.

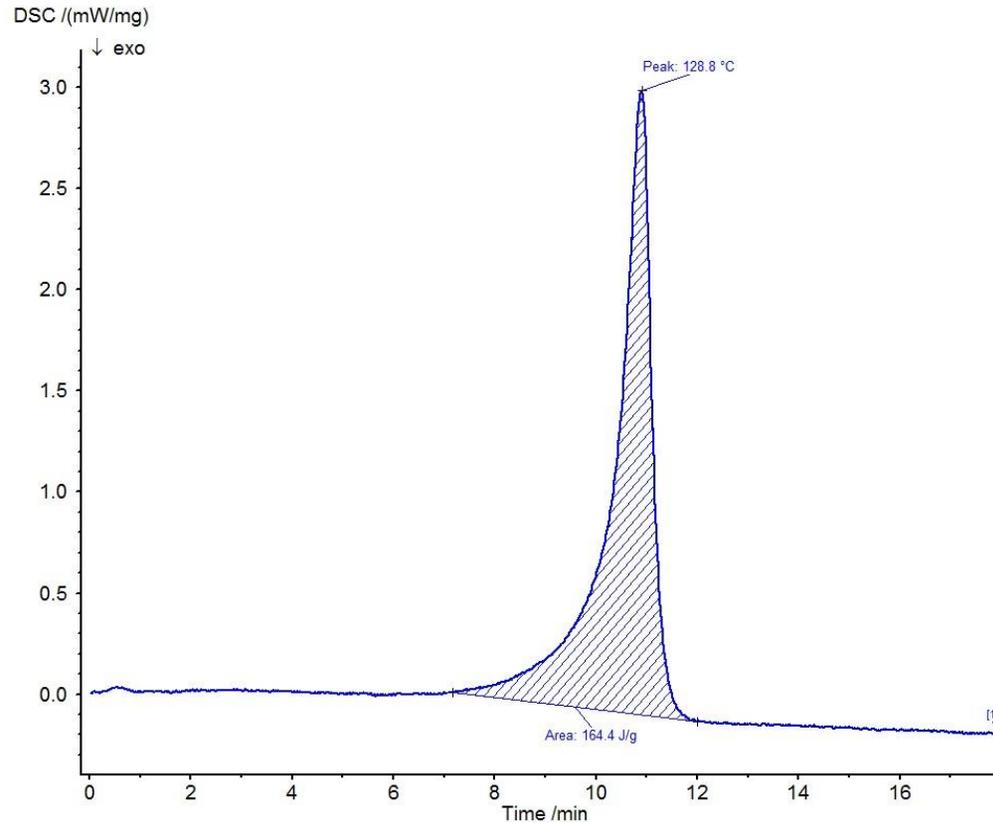


Figure 1. Results from the thermal analysis of a polyethylene waste bag by DSC for determination of the degree of crystallinity.

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