

Follow-Up Analysis of a Biodegradable Polyethylene *Project Report 4183*

Prepared for: Tom Murphy
Willow Ridge Plastics, Inc.
3208 Dixie Highway
Erlanger, KY 41018

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Project Manager: Brian Starr, Ph.D.

Prepared By: Jay Tuggle

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1872 Pratt Drive, #1375, Blacksburg, VA 24060
(540) 961-4300 • Fax: (540) 961-5778

Web: www.PolymerSolutions.com • E-mail: info@PolymerSolutions.com

Summary

Two LDPE samples were submitted for degradation characterization by Fourier transform infrared (FTIR) spectroscopy and inherent viscosity (indirect molecular weight comparison). The samples are identified below.

Willow Ridge Plastics, Inc. Identification	PSI Identification	Date Received	Date Tested
WRP-09-18B CONTROL LDPE SEPTEMBER 18, 2006	2006-487-01	09/21/06	09/22/06
WRP-09-18A DEGRADED LDPE WITH 3% PDQ-H LOADING SEPTEMBER 18, 2006	2006-487-02	09/21/06	09/22/06

The FTIR analysis was conducted using a Nicolet Magna 550 infrared spectrometer with an Inspect IR attenuated total reflectance (ATR) attachment. The germanium ATR crystal was brought into contact with the degraded sample, and scans were taken. The resulting spectrum is shown in Figure 1. Figure 2 shows the spectrum acquired from the control sample.

Of particular interest was the carbonyl index, located at 1715 cm^{-1} . This peak is expected to increase in height as the material degrades and is therefore a measure of the degradation. The spectra have been normalized based on the highest peak, and the peak height for the carbonyl index has been marked. The carbonyl group response for the degraded sample is 0.229. The response in the control sample is 0.029, which is no more than the baseline response.

The inherent viscosity (IV) of both samples was also measured. After drying the films for 1 hour at 80°C , approximately 250 mg of sample was dissolved in 50 mL of freshly distilled decahydronaphthalene modified with Irganox 1010 at 0.2 wt %. The measurements were carried out at 135°C . Note that ASTM D4020 provides a correlation between this measurement and the molecular weight. The molecular weight is also reported, but, since this is a correlation, caution should be taken when applying these data.

Table 1. Summary of inherent viscosity data.

Sample	Inherent Viscosity, dL/g	Molecular Weight, g/mol
WRP-09-18B CONTROL LDPE	0.972	57,960
WRP-09-18A DEGRADED LDPE WITH 3% PDQ-H LOADING	0.121	3,001

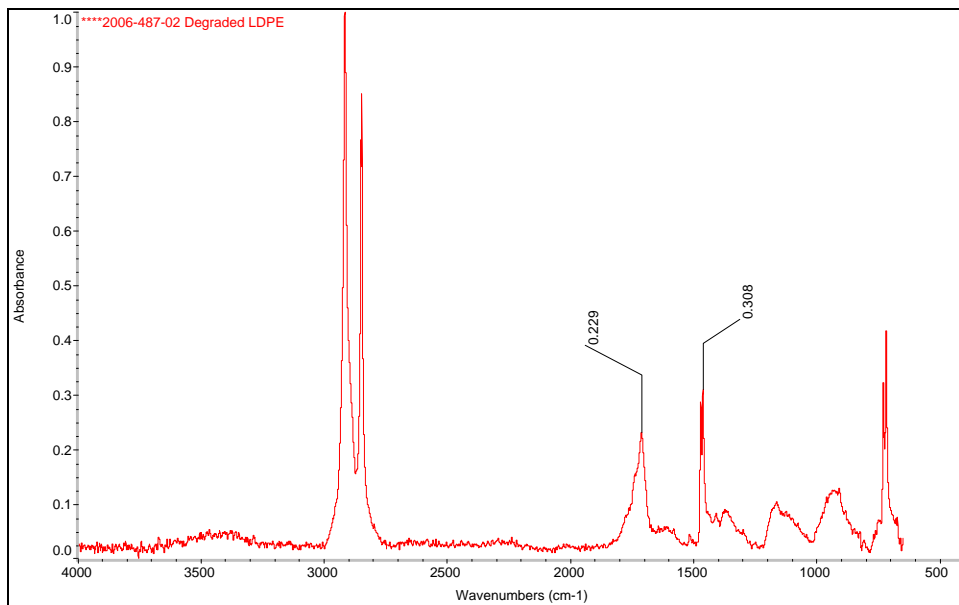


Figure 1. FTIR spectrum acquired from WRP-09-18A Degraded LDPE with 3% PDQ-H Loading (2006-487-02).

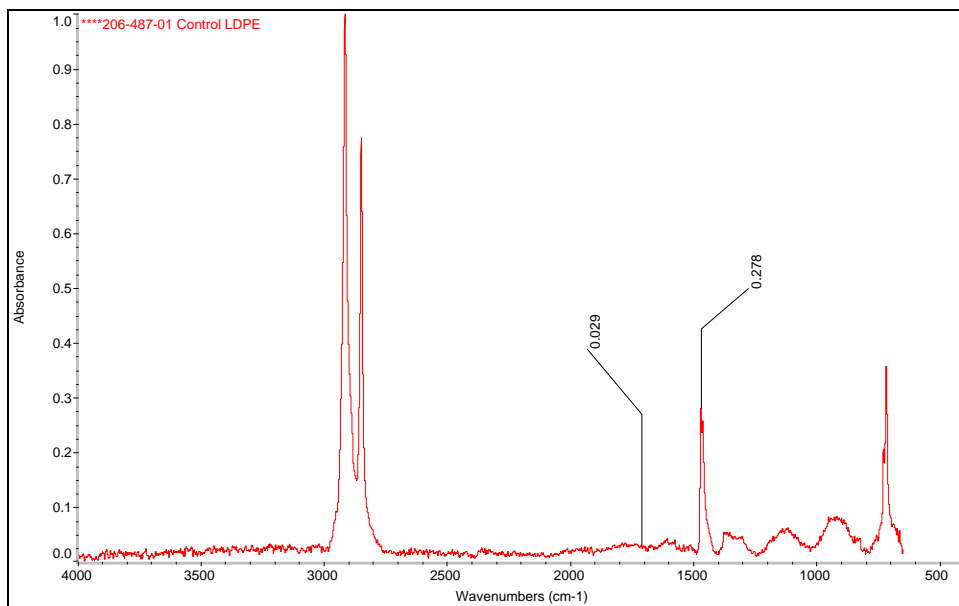


Figure 2. FTIR spectrum acquired from WRP-09-18B Control LDPE (2006-487-01).

Authorized For Release By:

James D. Rancourt, Ph.D.
Technical Director