



**CASE STUDY**  
**FTIR for Lot QC of Polymers**

**PROBLEM**

The objective of this study was to highlight the ability of FTIR to be used as a routine QC method for polymeric materials, in this case to identify the general polymer class.

**ANALYTICAL STRATEGY**

A new lot of resin was analyzed against a known polypropylene standard for comparison. It is identified that the sample is not consistent. Using a database of over 23,000 entries, the polymer type was identified.

FTIR is sensitive to any component at a concentration of roughly 5% or greater, thus the technique is generally applied for identification of the chemical composition of the polymer matrix but not the additives package or other minor sample components.

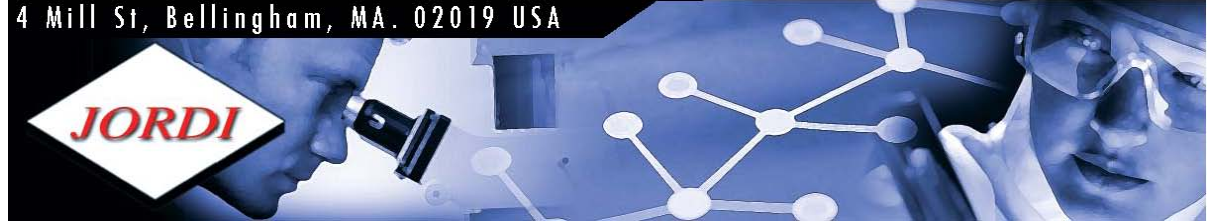
**CONCLUSIONS**

FTIR is a great method for the quick identification of the functional groups and general class of an unknown sample. By comparing samples to known standards it can be determined if polymers are consistent with each other. PYMS can be applied if additional information about polymer additives is desired.

Read the following report to see the full analysis.

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**JORDI**

# Final Report

Jordi Labs LLC  
Case Study

Date: xx/xx/xx

Released by:  
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President  
Jordi Labs LLC

Report Number: Jxxxx

Company Name Confidential



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Date

Client Name  
Company Name  
Address

Dear Valued Client,

Please find enclosed the test results for your samples described as:

1. 20090218-ILCTL
2. Polypropylene Reference

The following test was performed:

1. Fourier Transform Infrared Spectroscopy (FTIR)

## Objective

The objective of this work was to confirm that the chemistry of your sample is consistent with Polypropylene by Fourier Transform Infrared Analysis.

## Summary of Results

The sample showed a spectrum which was not consistent with Polypropylene. The sample spectrum was most consistent with polyethylene.

## Individual Test Results

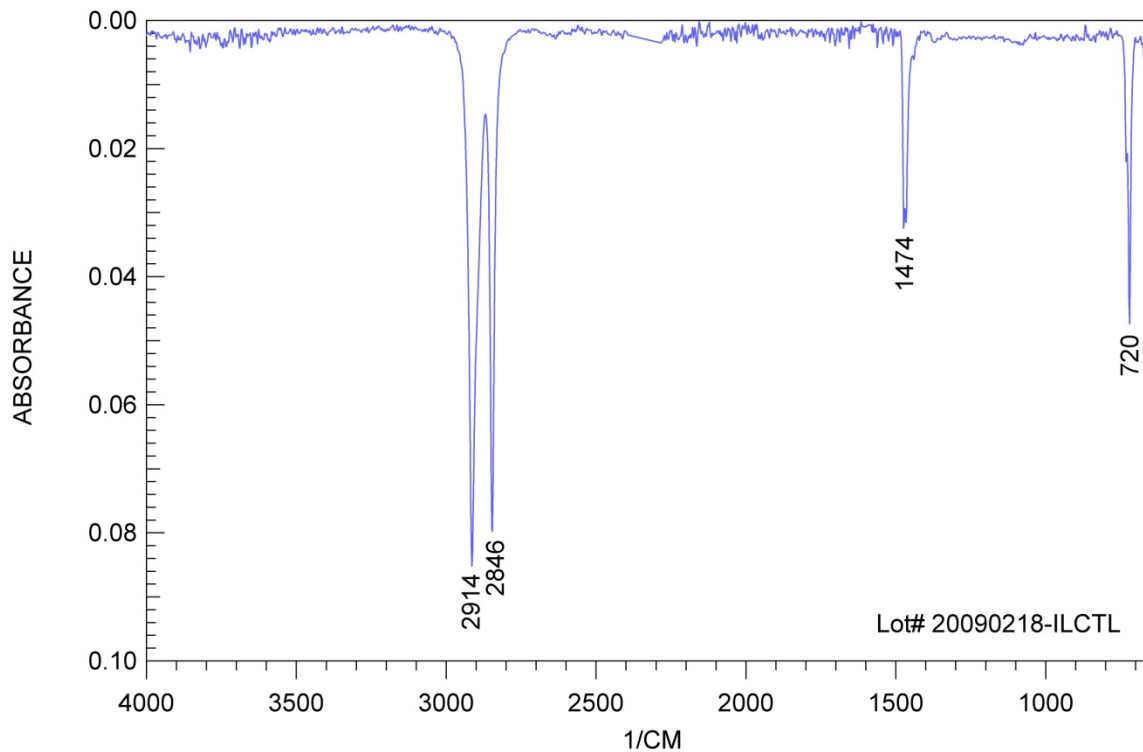
**A summary of the individual test results is provided below. All accompanying data, including spectra, has been included in the data section of this report.**

### **FTIR**

The sample spectrum was compared to our library database of ~20,000 entries and found to be most consistent with Polyethylene. The best match, hit list and overlays are included in the data section of this report. **Table 1** shows the spectrum peaks and identifications. **Figure**

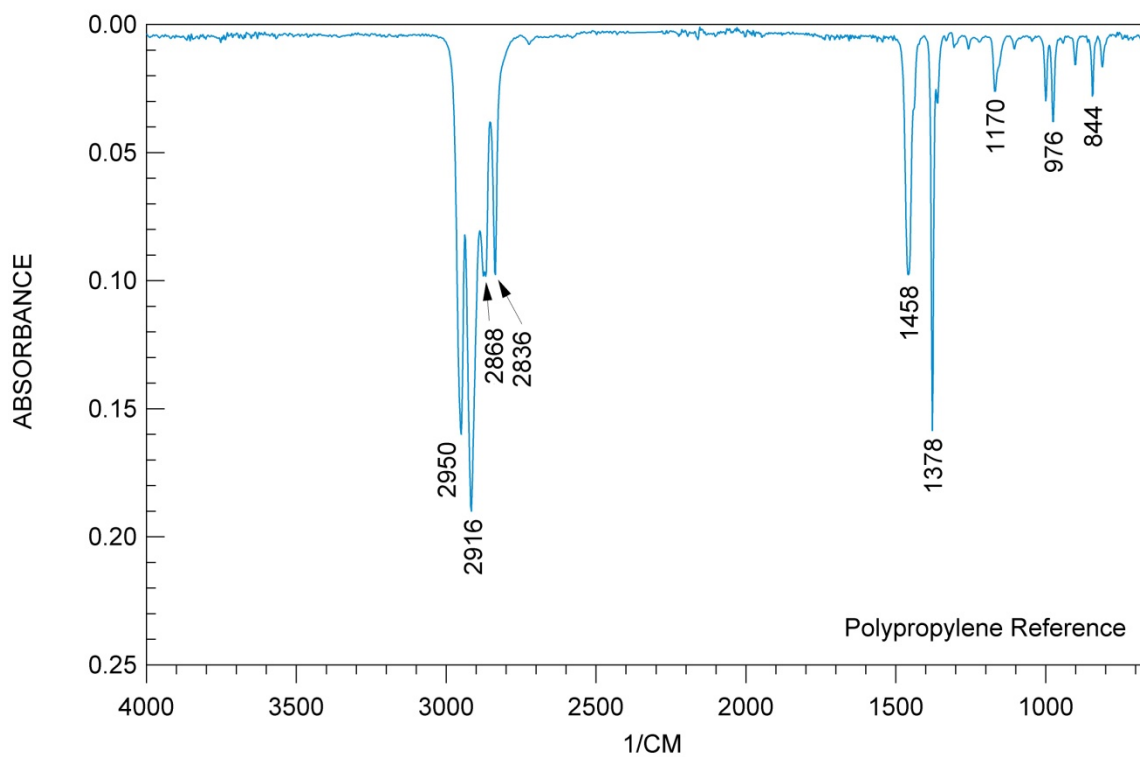
**1** shows the FT-IR spectrum for Lot# 20090218-ILCTL. **Figure 2** shows the spectrum of the Polypropylene reference standard and **Table 2** shows the peaks and identifications for Polypropylene. **Figure 3** is an overlay of the two spectra.

Table 1. <i>FTIR Peaks and Identifications for Lot# 20090218-ILCTL</i>	
IR Frequency (cm <sup>-1</sup> )	Functional Group
2914, 2846	CH stretch
1474	CH <sub>2</sub> bend
720	CH <sub>2</sub> rock

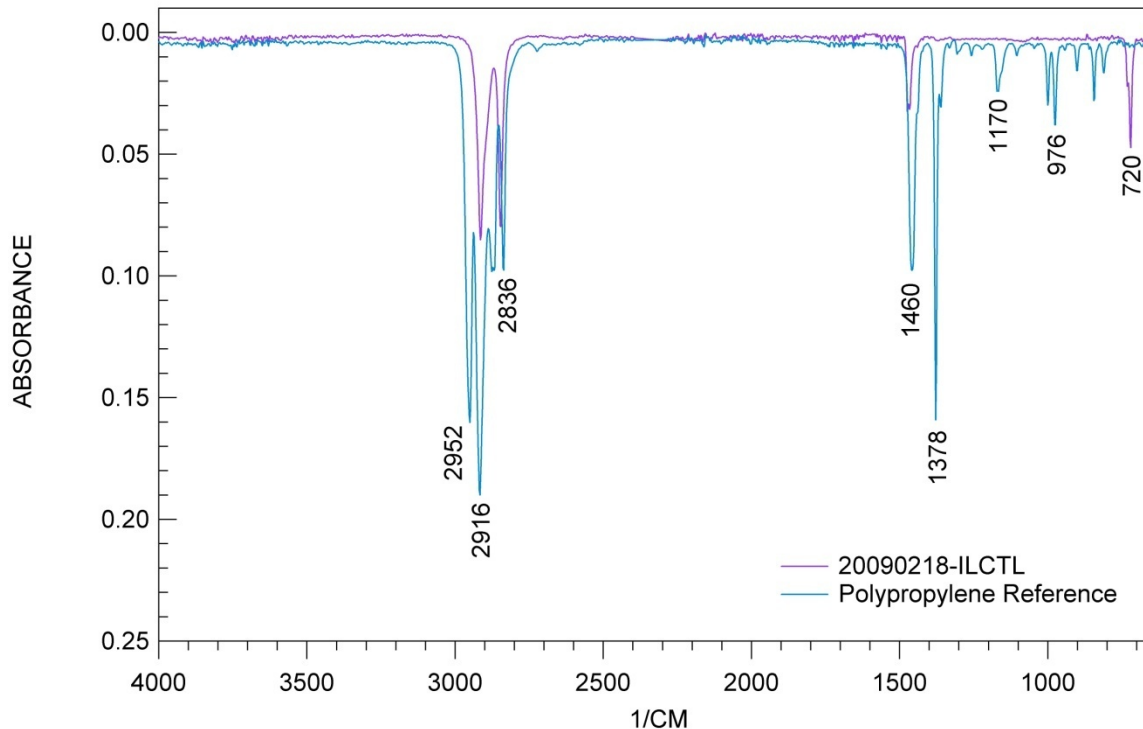


**Figure 1.** FT-IR Spectrum of Lot# 20090218-ILCTL

Table 2. <i>FTIR Peaks and Identifications for Reference Sample (Polypropylene)</i>	
IR Frequency (cm <sup>-1</sup> )	Functional Group
2950, 2916, 2862, 2836	CH Stretch
1458	CH <sub>2</sub> Deformation
1378	Symmetric CH <sub>3</sub> Deformation
1170	Isotactic Polypropylene Band
976	Isotactic Polypropylene Band
844	Isotactic Polypropylene Band



**Figure 2.** FT-IR Spectrum of Polypropylene Reference



**Figure 3.** Overlay of Lot# 20090218-ILCTL and Polypropylene Reference

## Analysis Conditions

### FTIR

A portion of your sample was extracted using a clean razor and tweezers and tested as-is on a Perkin-Elmer PC-16 FT-IR spectrometer fitted with a DuraScope diamond ATR system (an integrated video imaging accessory). The DuraScope is designed for the analysis of all sample types. The spectrum generated by the sample was compared to ~ 20000 entries in our library and the best match determined based upon absorbencies and peak intensities.

### Closing Comments

Deformation of an unknown material is intended to provide a best estimate of the chemical nature of the sample. All chemical structures are supported by the evidence presented but are subject to revision upon receipt of additional evidence. Additional factors such as material processing conditions may also affect final material properties.

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Jordi Labs specializes in polymer testing and has 30 years experience doing complete polymer reformulations. We are one of the few labs in the country specialized in this type of testing. We will work closely with you to help explain your test results and solve your problem. We appreciate your business and are looking forward to speaking with you concerning these results.

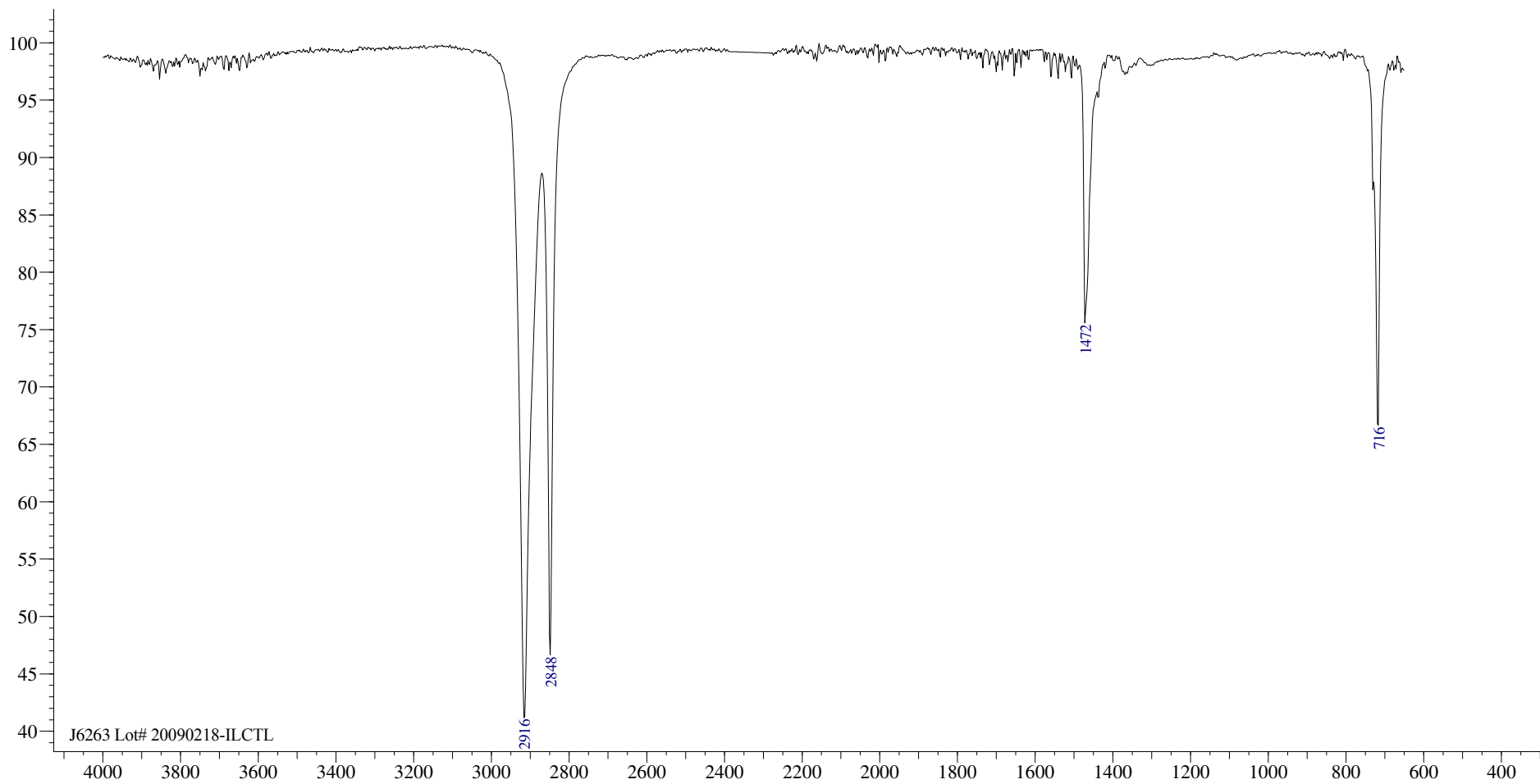
Sincerely,

*Mark Jordi*

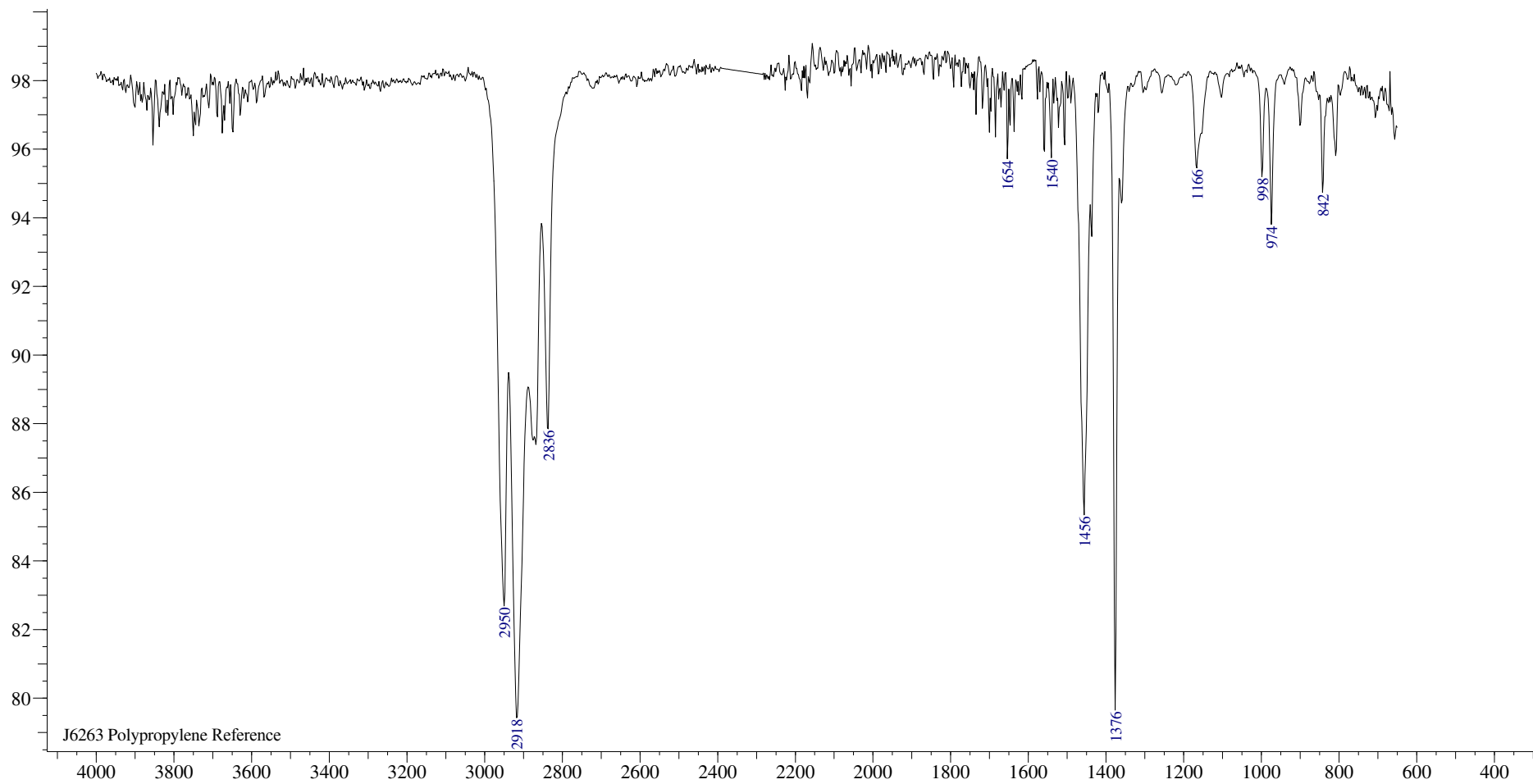
Mark Jordi, Ph. D.  
President  
Jordi Labs LLC

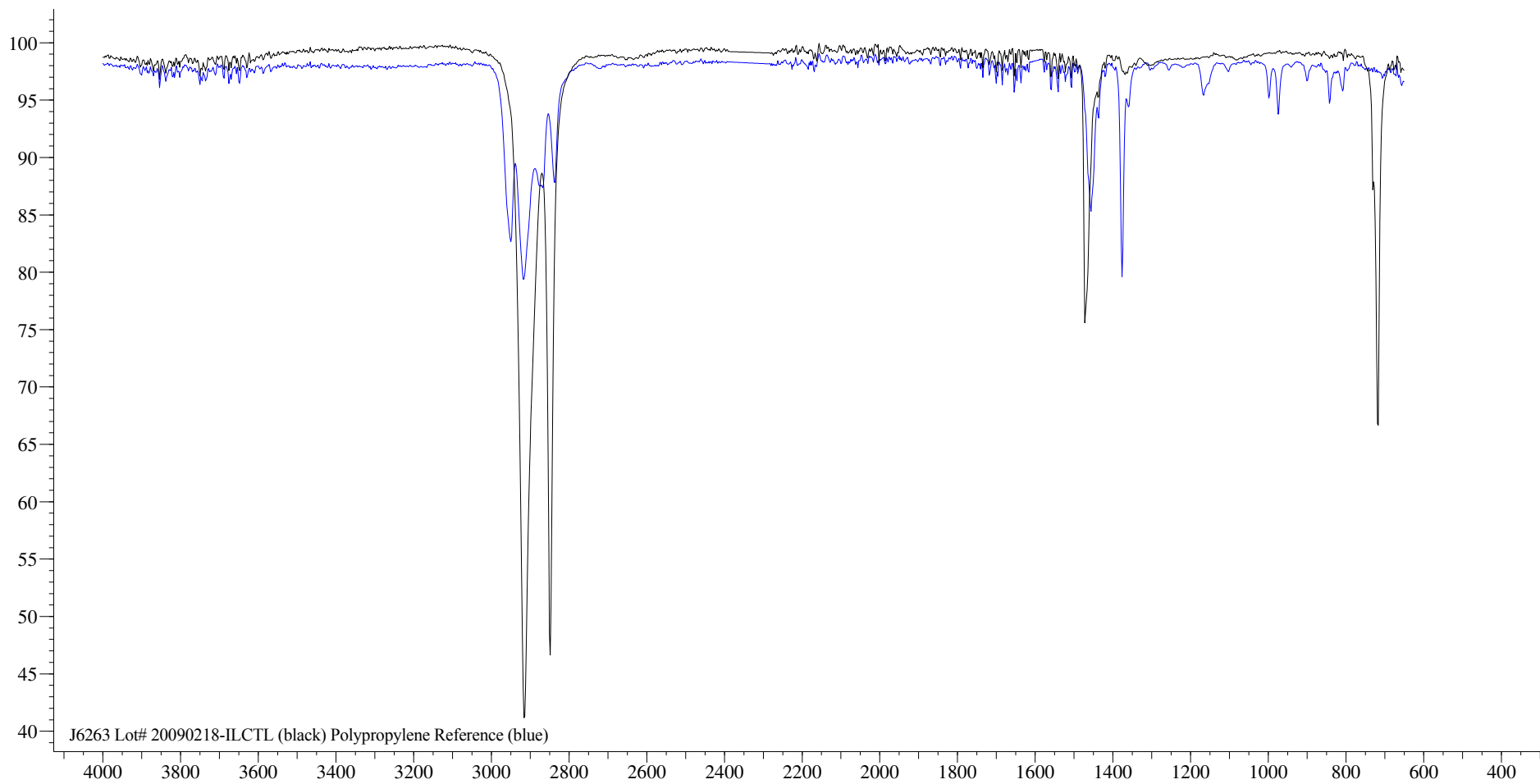
# FTIR Data



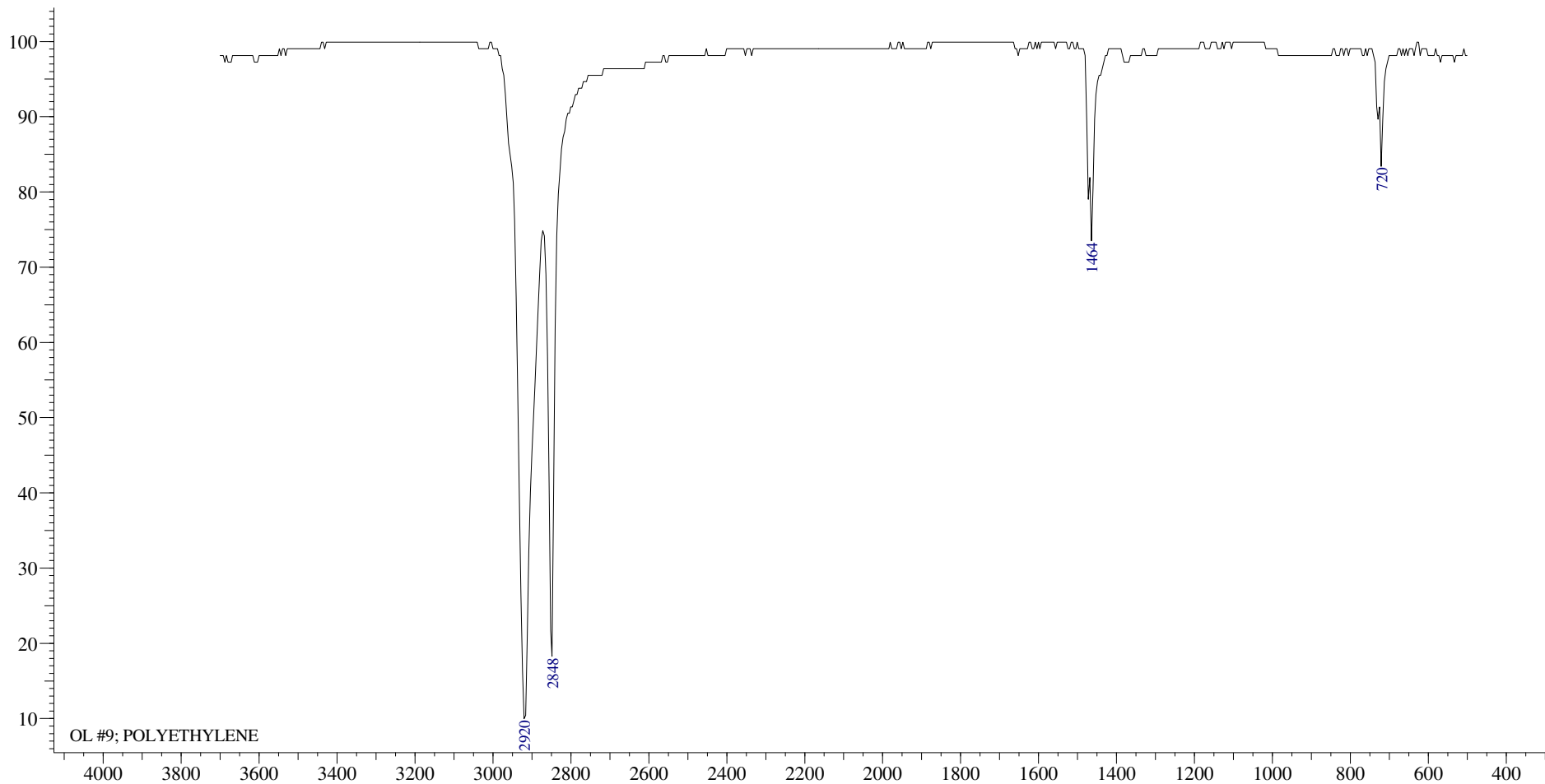


J6263 Lot# 20090218-ILCTL





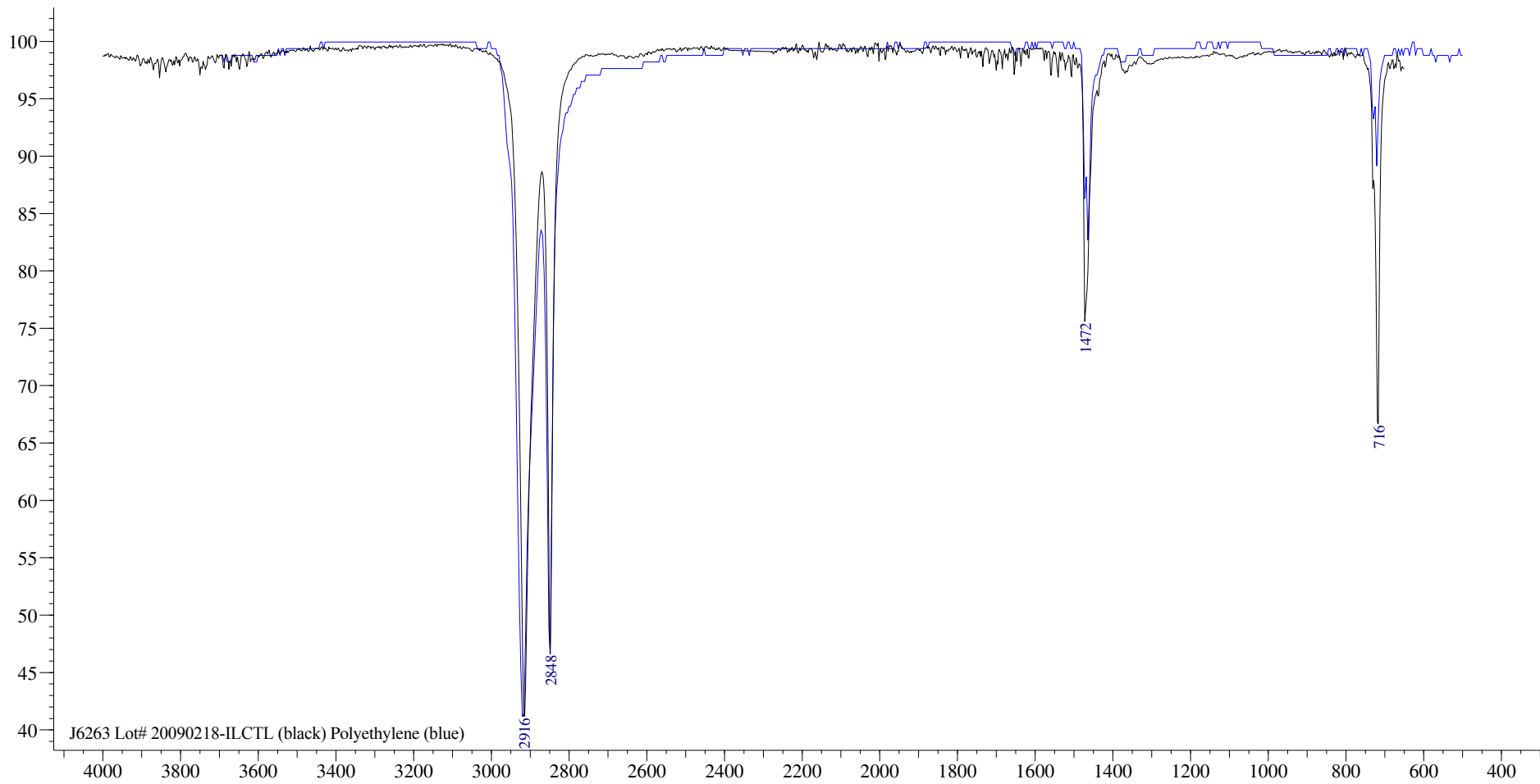
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OL #9; POLYETHYLENE



Name(s):	POLYETHYLENE
Source Of Sample:	ALDRICH CHEMICAL COMPANY, INC.
Technique:	FILM (CAST FROM o-DICHLOROBENZENE)
Classification:	Polymers: POLYETHYLENES

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## Best Match Hitlist for Lot# 20090218-ILCTL

Index	HQI	Chemical Name	Spectrum
OM #19	826.40	PETROTHENE NL 409-00	
OM #46	809.58	PETROLITE C-4040	
OM #613	800.40	CERAMER 5005	
RC #142	799.05	ROCK F T WAX	
OM #1	797.36	A-C POLYETHYLENE 316	
QF #97	791.70	HEPTACOSANE	
OM #17	785.55	PETROTHENE HD 5002	
OM #13	775.12	HOSTALEN GK9050 HO	
SR #167	773.65	PARVAN 3150, F.N. 3502*REFINED PARAFFI...	
OL #2	773.65	PARVAN 3150, F.N. 3502*REFINED PARAFFI...	
SR #167	773.65	PARVAN 3150, F.N. 3502*REFINED PARAFFI...	
OM #15	772.35	DISLON 4200-10	
OM #2	764.10	POLYMIST B-12	
AS #1526	762.64	THERMOGRIP 1317	
HS #6500	761.99	PARAFFIN WAX	
OL #9	761.94	POLYETHYLENE	
OL #1	761.00	PARVAN 2730, F.N. 3501*REFINED PARAFFI...	
OL #63	759.56	BAYLON V22H764*LOW DENSITY POLYETHYLENE	
QF #109	758.51	TETRATRIACONTANE	
Z777 #234	756.82	PT40.12302 HDPE ELTEX	
QF #103	747.40	OCTATRIACONTANE	
Z777 #237	743.57	PT40.12401 HDPE LUPOLEN 5723C	

Index	HQI	Chemical Name	Spectrum
OM #4	743.14	POLY-ETH 2205	
OM #44	741.99	PETROLITE CP-11	
OM #553	739.55	ASPUN 6814	