

CAPABILITIES OF GREEN GLOBE LABORATORIES TEAM

ISO 17025 Accredited



630-231-0680

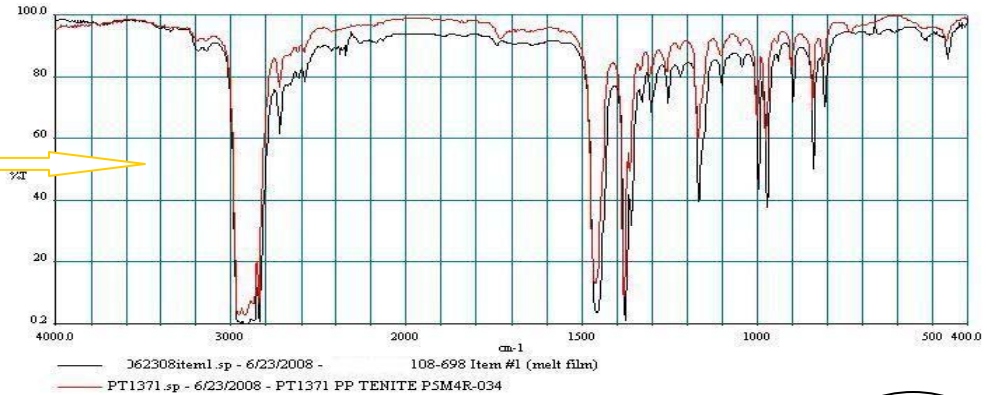
rajan@therightstuff.com
www.therightstuff.com
www.greenglobelabs.com

MATERIAL IDENTIFICATION:

Date: 6/23/2008

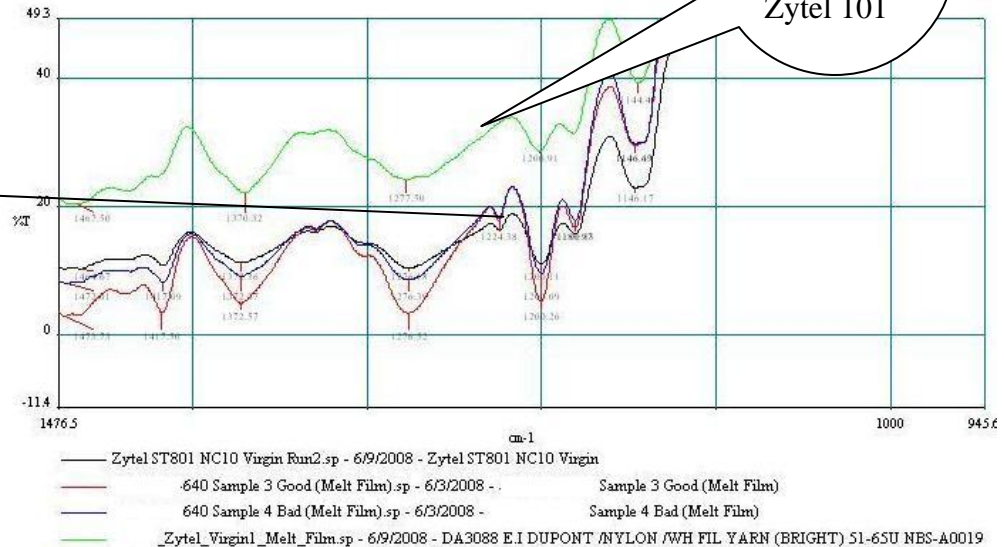
What are our parts made of?

We use FTIR technology to identify polymers and in some case even the trade name of the raw material. We can determine the extent of UV Curing. We can tell you if the surface of your part has silicone and quantify the silicone if present.



Overlay of spectra from Sample #3, Sample #4 and Zytel 101 and Zytel 801 resins indicates that Zytel 801 was used to make the parts. Zytel 101 does not have impact modifier. Part failure could be due to problems in the process and not in the material used.

Impact Modifier



FAILURE ANALYSIS:

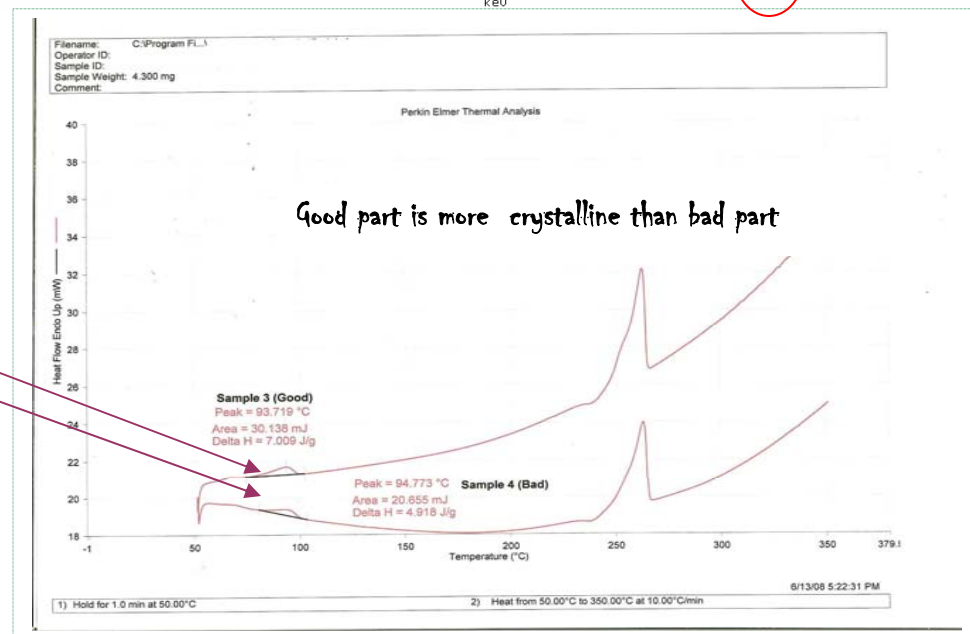
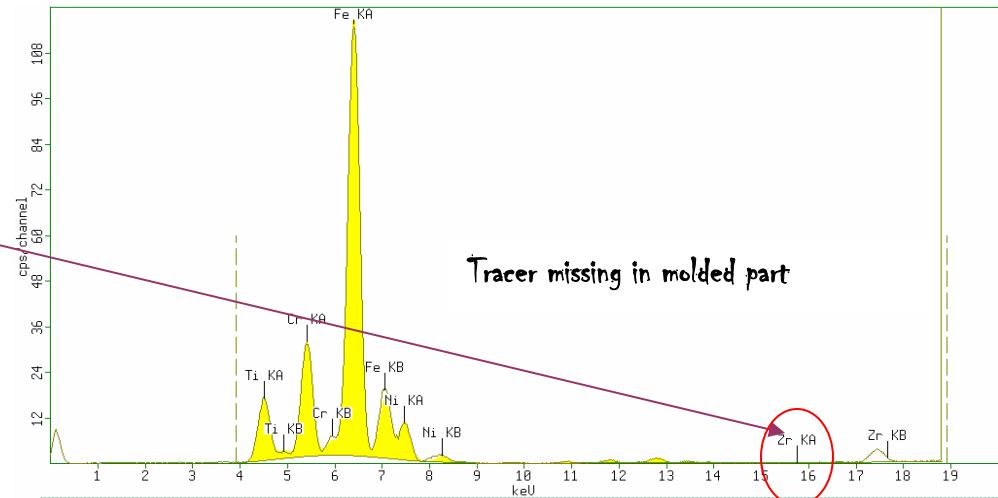
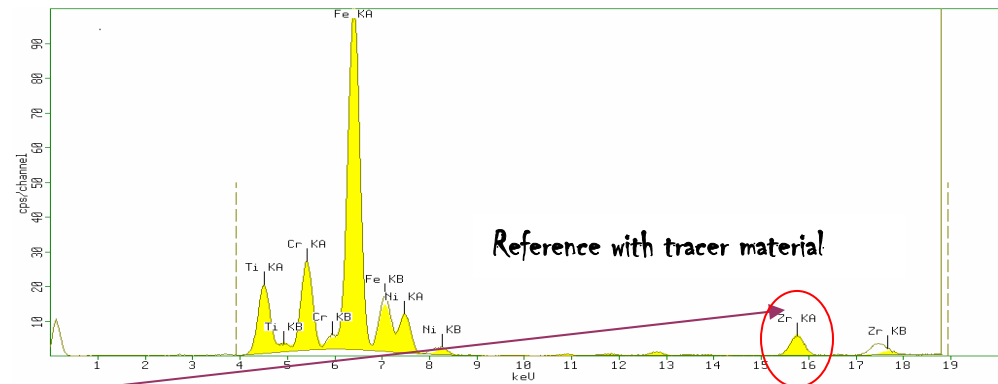
Did they use the right material to make my parts?

We test for elements in samples using X-Ray fluorescence (XRF) technology.

Raw material supplier added a tracer material and sent it abroad. Did they use it? Tracer is missing in the molded part. No wonder they the parts are brittle!

Why is part cracking?

Thermal analysis (DSC) is used to study the make up of the material. In the adjacent thermogram, "Bad" sample has less Low Density Polyethylene than the "Good" sample. Area under the peak at 94°C for bad sample is less than that of the good sample. Area under the curve at around 260°C for good part is more than that of the bad part. Crystallinity gives strength, but too much crystallinity makes the parts brittle.

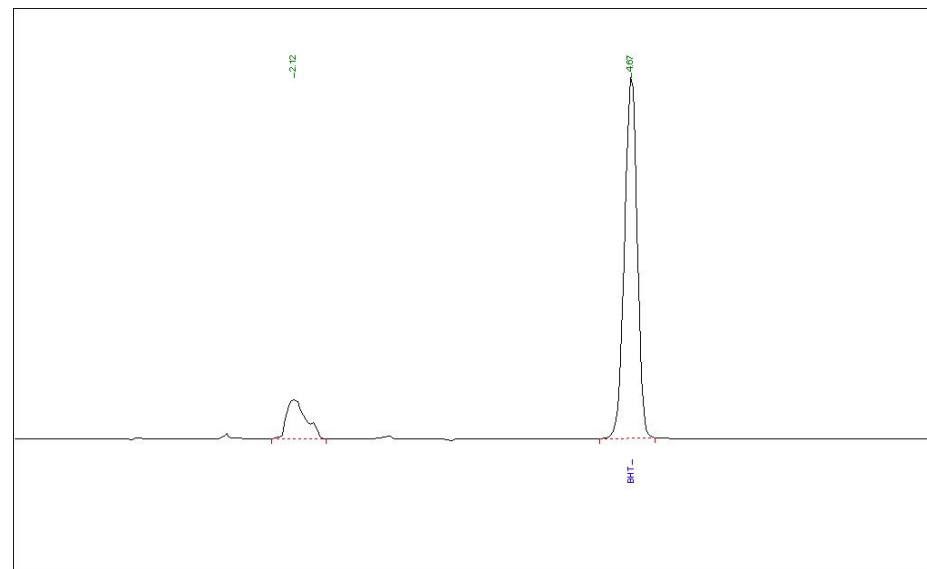


What Plasticizer did they use in my product and how much of it?

PRODUCT FORMULATION:

My supplier wet bankrupt. I don't have the formula. Now what?

We have the knowledge and instrumentation to deformulate the product by breaking it down and using instrumentations such as FTIR, DSC, XRF, Gas Chromatography, HPLC, etc.



REPORT:

How will you report results when the tests are complete?

Part A (Discolored Area): DSC studies were performed on the samples retrieved from the discolored surface of Part A sample. Based on the data, the sample appears to be cured completely. The ΔH value we obtained was 1.938j/g (See attached DSC results Sample ID:PartA10092007). Based on the cure results of the sample mixed in the lab, the ΔH value was 150.427j/g. This gives a percent cure of 98.7% for the Part A discolored area sample.

However, we noticed a shift in the Tg of the material when it is reheated. During the first run of DSC, Tg was 79.2°C. (See attached DSC results Sample ID:PartA10092007) When the sample was reheated to ensure the first study's cure results, the Tg value shifted from 79.2°C to 121.5°C (See attached DSC results Sample ID:PartA10092007_Run2). This may be a sign of the material becoming more and more brittle when subjected to heat.

Part B:

1. Uncured Sample (Mixed in the lab)
 - a. ΔH value was 53.159j/g. (See attached DSC results Sample ID: PartB10092007_uncured)
2. Sample cured at 24°C (See attached DSC results Sample ID: PartB10092007)
 - a. The results indicate a cure of about 89.96%
3. Sample cured at 80°C (See attached DSC results Sample ID: PartB10092007_80Deg)
 - a. This sample appears to have completely cured.

Relay Housing:

Based on the DSC results(see attachment. Sample ID: Relay Housing RHS 10102007) ("RHS" in the sample ID indicates that the sample was taken from right hand side of the housing with the probe facing you), a Tg was observed at 51.7°C and melt temperature of 225.93°C. While this data led us to believe that the material is PBT (Polybutelene Terephthalate), to confirm our findings, we performed an FTIR study and confirmed our results. (See attachment eas_relay_housing_1.002)