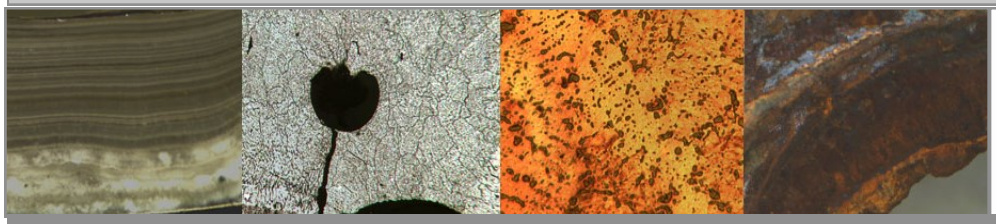
NUTS & BOLTS



New Hampshire MATERIALS LABORATORY, INC.
Your Problem Solving Partner

Welcome to New Hampshire Materials Laboratory

Over the years, NHML has dealt with a number of industries and companies in the assistance of identifying contaminants, unknown materials and helping them better understand their products. We are able to confirm the identity of products and/or detect specific impurities within the products. In this months Nuts & Bolts supplement, FTIR Spectroscopy is discussed. A case study within the aerospace industry is also discussed.

For more information or to find out more on how we can be “Your Problem Solving Partner”, please visit our website at www.nhml.com or call our toll free number 800-334-5432.

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To Be Continued on Page 2 →

An Outsiders Take on FTIR

By: Shannon Cicolini

When I first started working for New Hampshire Materials Lab, I had never heard of any materials testing method that we are capable of performing . Out of all our chemical testing abilities, I found FTIR spectroscopy to be the most interesting. Now what is FTIR spectroscopy you ask? Don't worry, I asked myself that same question. Here's what I've learned:

> FTIR stands for Fourier Transform Infrared Spectroscopy and is the most widely used method of infrared spectroscopy. It is a specific technique of testing that is important in organic chemistry and can be used to confirm the identity of a pure compound or to detect the presence of specific impurities. This test can help our clients to be able to understand their materials and products. It is also useful for routine material verifications, identification of polymers and identification of contaminants. During the FTIR testing process, an infrared light is passed through a given sample. This sample has characteristic absorption frequencies throughout the infrared region. By passing the infrared light through the sample, an infrared spectrum is produced showing a series of peaks and valleys on an x and y-axis graph. This spectrum is what we call a chemical fingerprint. This fingerprint is then analyzed by our Senior Chemist, Jeff Masse, who then reports on his findings. (See figure 1 for a layout on the basic concept on how the FTIR testing method works).

FTIR is a fairly quick and simple test procedure that can provide an abundance of useful information for our customers. Throughout the years, NHML has helped many customers in a variety of industries with this method of analysis. I have picked the following example to share that I believe can not only help give you insight on our capabilities, but to also show you that FTIR can provide essential and useful information to our customers in solving their problems.

FTIR Case Study (Aerospace Industry)

Pins from an assembly were provided to NHML that contained an unknown contaminant. The customer has asked for us to identify the general chemistry "family" to which the contaminant belongs. The pins were first analyzed under an optical microscope at 40x magnification. One of the samples had a contaminant flake within a depression at the midpoint of the pin, whereas the other pin appeared to have a greenish brittle flaky substance on the surface just below the depression.

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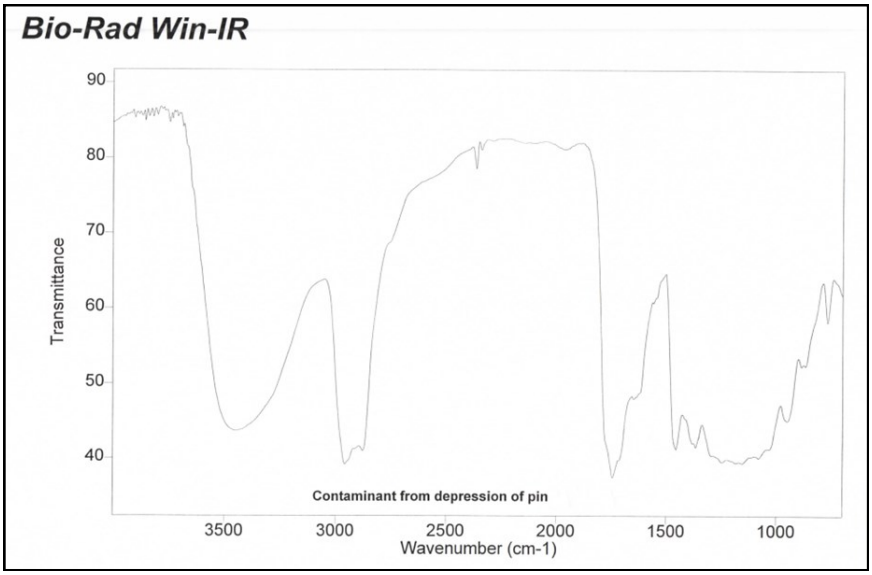
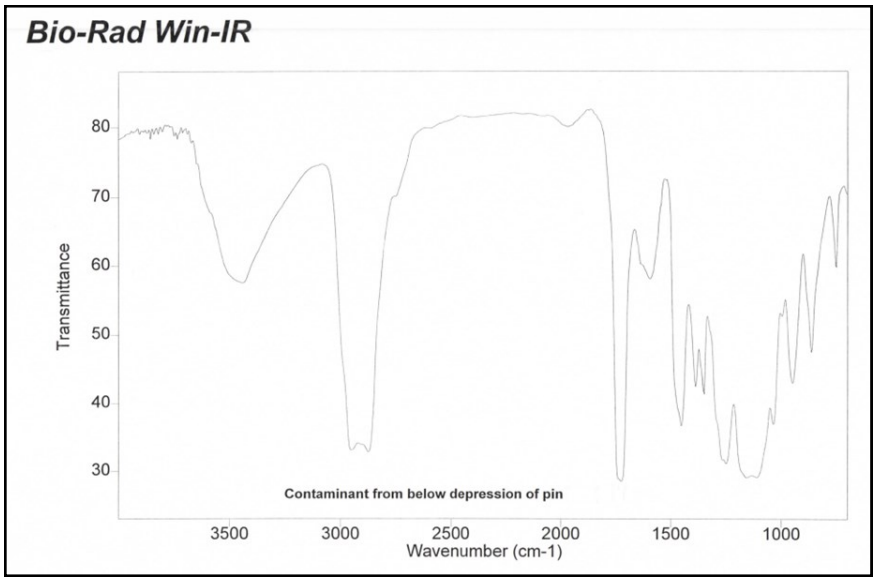
These contaminant flakes were picked off of the pins with the small tip of an x acto knife and analyzed separately via FTIR producing the following 2 spectra:





The spectra show the contaminants from the two pins to be the same type of material. The series of absorption peaks in the spectra are characteristics of Ester and Alcohol functional groups.

In order to determine the elemental composition of this contaminant material, a small portion was sampled and analyzed by Energy Dispersive X-Ray Spectroscopy (EDX). This produced the following spectrum:

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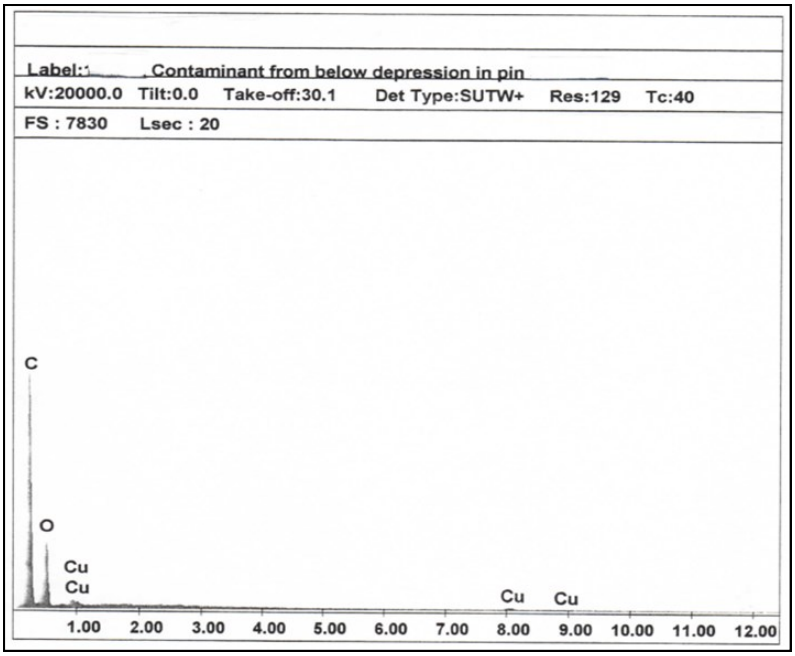

The spectrum shows large peaks for Carbon and Oxygen as well as a small peak for Copper. This small quantity of copper explains the light greenish color of the flaky contaminant, which was also observable under the microscope. The EDX spectrum show the contaminant to be non-metallic in nature. It was also found to be nearly 100% organic with only a trace of copper detectable. Based upon the information the customer gave us, the only remaining contaminant suspect was an Adhesive Sealant. The MSDS for the sealant showed a major ingredient to be Polyglycol dimethacrylate, which is a reasonable match to the FTIR spectrum produced by the samples. A more exact comparison could be made between the Adhesive Sealant and the contaminant by analysis of a reference sample of the Adhesive Sealant by FTIR.

I have found that as time goes on and the more testing scenarios I see and learn about, I have realized that what we do as a company is truly fascinating and enlightening. I have never known that such a service is readily available and what really took me by surprise is how much we actually help people with their problems and questions. NHML's motto is to be "Your Problem Solving Partner" and from what I've seen that is exactly what we do. I am proud of the attentiveness and dedication our analytical staff provides for our customers as that's what business should be about these days. Whether it is a simple consulting question or an actual job, our staff makes themselves accessible as much as possible and works diligently to complete the project at hand.

If you have any questions regarding this topic, please don't hesitate to contact us at info@nhml.com or you can call on our toll free number 800-334-5432.

To Be Continued on Page 5

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