

What's New at PIKE Technologies by Scott Little, President

Welcome to the *Summer 2005 edition of the PIKE Reflections* newsletter. As usual, there are a lot of new things going on at PIKE we want to tell you about.

As the saying goes, "If you want to see how a company is doing, just drive by and look at their parking lot". From this recent picture (right), you can see that we are busier than ever. In fact, we have grown so much this year; we have run out of parking spaces for all of the cars. But no worries, if you have visited us recently, more spaces are being added. It's only a matter of time before our building will need to get bigger as well. So who do we owe for this continued record growth in 2005? Of course, it is you, our customers, for placing trust in PIKE for providing all your spectroscopic sampling needs. **Many thank yous!!**

Along with our increasing sales, we also have increased the PIKE staff and the number of distributors around the world.

New Spectral Data Bases - for FTIR Search by Ken Kempfert

We are pleased to announce that we now offer high quality spectral data bases for FTIR spectral identification. We have just released these new spectral data bases with over 75,000 spectra packaged in comprehensive or applications specific versions.

Our new search libraries are available in several formats including ATR (over 27,000 individual spectra), and transmission (over 48,000 individual spectra). We are especially excited about the ATR



First, we would like to welcome **Paula Haenel** as our newest Manufacturing Product Specialist. Paula is responsible for assembly and testing of many of our transmission sampling devices, such as liquid cells, hand presses, bolt presses, die kits, gas cells, sample holders and various sampling kits.

Our newest PIKE distributor is **Kromatek** of Great Dunmow, Essex in the United Kingdom. Kromatek is an independent distributor in England and Scotland specializing in the sales and service of accessories for the analytical laboratory.

We are very excited about Kromatek joining

data bases as so many of our customers are using ATR as their primary means of FTIR sampling. Spectral data bases collected using ATR provide superior search results compared to searches done using transmission spectral data bases.

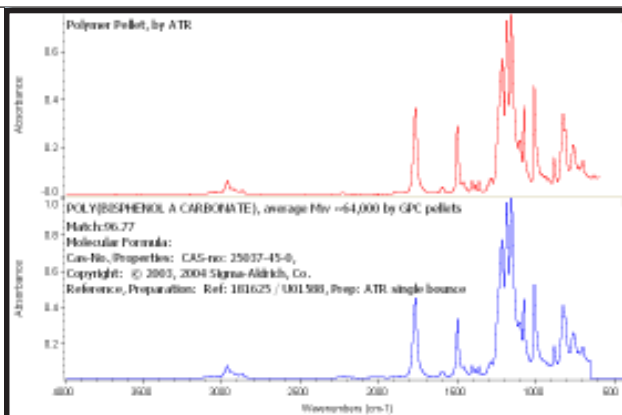
If you would like more information about our new spectral data bases, please contact us by e-mail at sales@piketech.com, or give us a call!



Parking lot at PIKE Technologies - it's full. Not to worry, it is being expanded at the time of this press.

the PIKE team as their staff is very experienced with FTIR, NIR and UV-Vis spectroscopy applications. So, if you are located in this area and have any molecular spectroscopy needs, contact Kromatek at www.kromatek.co.uk.

We hope 2005 is going well for you. If there is anything we can do to help you, please call us at (608) 274-2721 or let us know by email at sales@piketech.com. **Our goal is for PIKE to be your favorite spectroscopy company!**



Upper spectrum of a polymer pellet measured using the MIRacle ATR accessory. Lower spectrum is the best library search result - polycarbonate from the ATR spectral data base.

Micro Transmission Analysis of Hair and Fibers Using the μ Max™ Infrared Microscope by Gabor Kemeny, PhD.

Identifying and characterizing small samples has long been a necessity in infrared analysis. (1,2) Production materials in the polymer, chemical, pharmaceutical and food industries may contain small contaminants that need to be identified to eliminate the origin of the contamination. Single reflection ATR accessories can be used for small samples (3). The combined visualization of the smallest possible sample size coupled with its infrared (IR) analysis, however, is much easier and faster using an infrared microscope, such as the PIKE sample compartment optimized μ Max™. In some industrial and research areas, the available sample size or quantity is so small that only a microscope with its superior viewing and aperturing capability is able to handle the sample. Such is the case when a well-identified portion of the sample needs to be measured. For example a pre-defined layer of a multi-layer sample or a certain part of a cell anatomy has to be discriminated from an adjoining area or structure.

Micro-reflectance and micro-ATR are also possible with modern infrared microscopes. Transmission measurement of such samples, however, is often the first choice because of the superior throughput of most infrared systems in a transmission mode. The sample must of course be held with an infrared transparent window and the sample must have the proper infrared transmission characteristics in order to obtain a good spectrum. It must be noted that samples that are very small, such as a hair sample, may still be too thick for the infrared light. Hair and fiber samples are frequent microsamples for industrial and forensic applications and a sample preparation step is necessary before placing the sample in the beam.

Slicing samples with a microtome requires additional equipment and some experience. For simple sampling of extended size polymers, for example, PIKE Technologies recommends the use of the Micro Plane handheld tool (P/N 162-0030 with carbide tip, or 162-0040 with diamond blade) which shears off a small, very thin sliver of larger polymer

artifacts. For fibers, the Diamond Compression Cell (P/N 162-0010 with 1.6 mm and 162-0020 with 2 mm diameter clear aperture diamonds) is recommended. Human hair, for example, can be placed on the diamond element and flattened by tightening the three mounting screws to a thickness optimal for a direct infrared measurement through the infrared transparent diamond. As an example a 60 micron human hair is flattened to nearly 300 micron width. A simple technique to obtain a background with conditions as similar as possible to the samples, is to place a few grains of KBr next to the sample before pressing the diamond plates together. This



way the KBr is pressed at the same time, melting to optically clear transparent islands that can be used for background scans (Fig. 1, above). This sample preparation and plac-

ing the diamond cell in the infrared beam of the microscope allows the measurement of very good quality spectra using the standard DLaTGS detector of the FTIR bench at 1 minute measurement time with 4 cm⁻¹ resolution. (Fig. 2).

Infrared microspectroscopy is a powerful tool in solving such socially important and profound problems as the mystery of some Barbie™ dolls having softer, shinier hair than others. In order to address this problem, small filaments of hair were borrowed from a few different locks and analyzed under the microscope. Some of the fibers were thicker; the one from Barbie on the right, had an 89 μ m diameter for example. The finer hair of the Wisconsin Badger Barbie™ on



the left was 38 μ m in diameter, measured with a micrometer caliper.

The Diamond Compression Cell easily

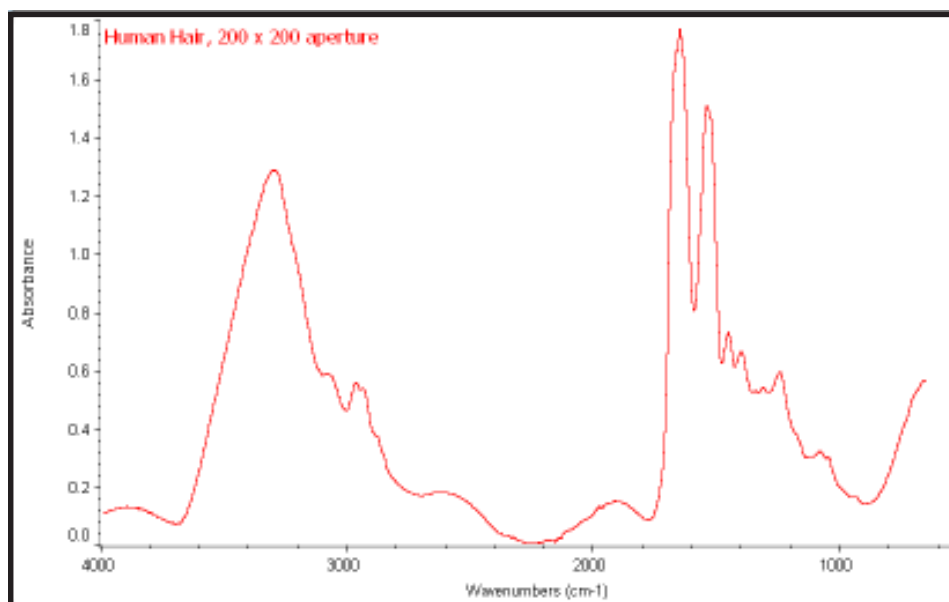


Figure 2. Micro transmission spectrum of a human hair.

Spectroscopic Creativity - our Customer's Perspective

When it comes to establishing the chemical structure of proteins, a great resource to turn to is a small company on the border of Illinois and Wisconsin, BioTools, Inc. This company is the developer of sampling technology for protein analysis, and are providers of IR and Raman protein and vibrational circular dichroism (VCD) spectral databases. Proteins used in the biopharmaceutical industry come in different forms. In all cases however the sampling interface has to be the best to preserve the protein structure, and has to be reproducible and simple.

Dr. Rina K. Dukor, the president of BioTools

Micro Analysis - cont.

flattened the single fibers to a transparent strip for the infrared microscope measurement and the aperture was set to match the flattened fiber (around 300 μm width). Increasing the measurement area and forming uniform layers also enhances the quality of the spectra. Using the bench DLATGS detector with two-minute scan time, excellent spectra were obtained (Fig.3), very different for the two different types shown. Please note that both spectra show some residual interference, probably due to the diamond discs being parallel after compressing the samples. This wave in the baseline did not interfere with the proper identification of the respective materials. Spectral library search identified that the thicker, less shiny fiber (Fig 3, blue), was polypropylene, with possibly a small amount of additive or copolymer, whereas the thinner, shinier hair was identified as poly-vinylidene-chloride/poly-vinyl-chloride copolymer (Fig 3, red).

CONCLUSIONS

The μMax sample compartment mounted infrared microscope is an easy to use, excellent tool for small samples. Accessories, such as the Diamond Compression Cell help optimize the thickness of samples, such as fibers, that would otherwise be too thick for infrared analysis. In most cases the DTGS detector of the FTIR spectrometers can be used to obtain spectra with good signal-to-

noise ratio, eliminating the need for more expensive cooled detectors.

is a leader in structural analysis of proteins using vibrational spectroscopy. Dr. Dukor is using a temperature controlled MIRacle Single-Reflection Diamond ATR for the development of an ATR based protein library. The advantage of the Single-Reflection ATR is that both solid and solution form protein samples can be analyzed on the same platform without sample preparation.

Late in 2004, BioTools, PIKE Technologies and Inproteo/Tienta Sciences, Inc. of Indianapolis, IN started collaborating on a new and exciting sampling method for protein microspectroscopy. PIKE's new sample compartment mounted infrared microscope, the $\mu\text{Max}^{\text{TM}}$ capable of analyzing very small protein droplets proved to be the ideal tool for this purpose. Some of the results of this



collaboration have been reported at ICAVS-3 in August 2005.

For more information on the above research you can e-mail Dr. Dukor (rkdukor@aol.com) or contact her at her office (847-487-5500).

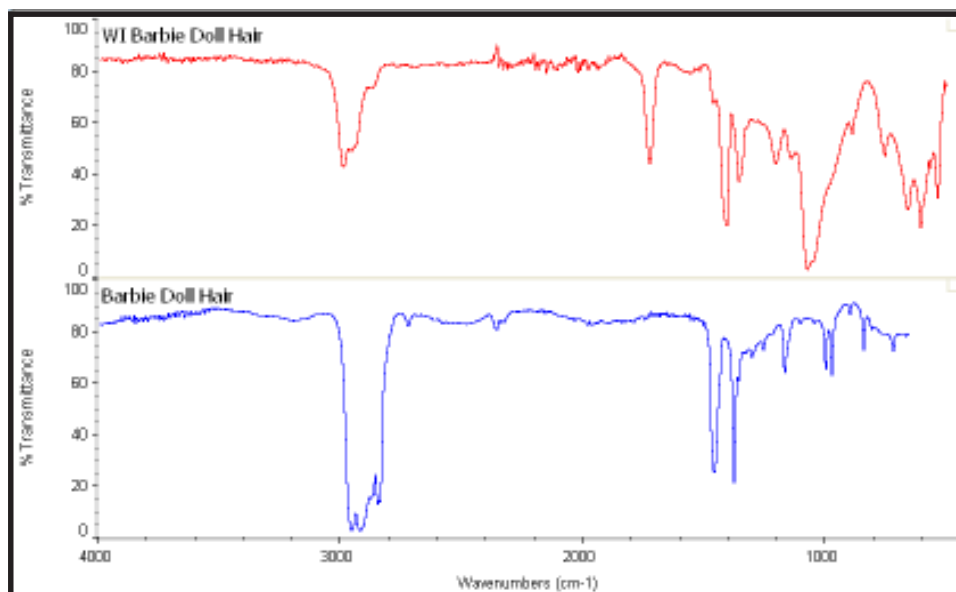


Figure 3. Spectra of hairs from Barbie Dolls. Upper spectrum is from Wisconsin Barbie doll, lower spectrum is from Other Barbie Doll. Both spectra were measured using the μMAX IR microscope in the transmission sampling mode.

noise ratio, eliminating the need for more expensive cooled detectors.

The author wishes to thank Ms. Dawn Streuly and her daughter, for sharing their Barbie dolls for the above scientific endeavor. All of us at PIKE wish to express some pride in that our Wisconsin Barbie has shown superior qualities compared to some of her sisters. Oh, and finally we would also like to emphasize that it is not true that we have too much free time, nor that we are having too much fun here at PIKE finding dubiously beneficial projects.

References:

1. Sommer, A.S.: Mid-Infrared Transmission Microspectroscopy. Handbook of Vibrational Spectroscopy, Vol. 2, pp.1369-1385, Eds.: Chalmers, J.M., Griffiths, P.R. (2002)
2. Messerschmidt, R.G., Harthcock: "Infrared Microspectroscopy Theory and Applications", Marcel Dekker (1988)
3. US Pats. 6,128,075 and 5,965,889

- *What's New at PIKE?*
- *New Spectral Data Bases*
- *Micro Transmission Measurements Using the uMAX Infrared Microscope*
- *Spectroscopic Creativity - Our Customer's Perspective*
- *New Offers for Spectroscopy Sampling from PIKE!*
- *\$1,000 Question & Answer*
- *Events Calendar*



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Madison, Wisconsin 53719

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Madison, WI

New offers for Spectroscopy Sampling from PIKE! by Krista Garcia

Are you considering the purchase of a single reflection ATR? Now may be the perfect time! We are offering a special promotional price for our very popular MIRacle ATR.



If you would like more information about this limited time offer, please contact Krista by phone, e-mail at

garcia@piketech.com or see our web site at www.piketech.com.

Our new Comprehensive Catalog of FTIR Accessories and Supplies is printed and ready for you! Its content is brand new with all of our products from sampling kits and ATR accessories to integrating spheres and microsampling accessories. Literally every section of the catalog has new products to help meet your spectroscopy sampling needs. We have added significant applications content to the new catalog and we think

you will find this helpful in selecting the right accessory. We are sure you will find our new catalog a valuable resource to help provide sampling solutions for your analysis requirements.



Please contact us at sales@piketech.com to get your copy of our new catalog.

\$1,000 Question & Answer

Thank you for all of your replies to our last \$1,000 questions. In what year and what city was the first PITTCON held? The correct answer is 1950 in Pittsburgh. Who is considered to be the Father of Microspectroscopy? The correct answer is Anton Van Leeuwenhoek of Holland.

We had a large number of correct responses to the questions - so we did our famous PIKE drawing! And the winner is.....V. Ramabhadran of Swaathi Scientific Solutions. Contratulations, you are the winner, so it appears that you are both wise and lucky!

And now we are into August and it seems that everyone is thinking about a vacation and perhaps an upcoming scientific conference. Well, just to get you back to some real science, here is our new \$1,000 question; for all you practicing spectroscopists!

Provide 3 reasons why CsI is not a good crystal material for ATR spectroscopy?

Send your answers to sales@piketech.com and you could be the winner of a \$1,000 accessory discount and a PIKE gift.

PIKE Events Calendar

ICAVS 2005, Aug 14 - 19
Lake Delavan, WI

ACS East 2005
Aug 28 - Sept 1
Washington DC
Booth # 1141



PITTCON 2006
March 13 - 17
Orlando, FL



We hope to see you at one of these locations!