# THE microREPORT

Volume 25, No. 1 | micromeritics.com



micromeritics®

# Micromeritics New Products

## 3Flex TCD

The 3Flex TCD is the industry's most highly recognized chemisorption and physisorption instrument. With the addition of the integral thermal conductivity detector (TCD), various chemisorption analyses are accessible such as temperature programmed reduction (TPR), oxidation (TPO), and reactions (TPRx). Exclusive to this instrument are localized loop valve temperature measurement and control that improves precision, signal detectability, and repeatability of the temperature-sensitive TCD detector.

## NanoPlus HD (Particulate Systems)

The NanoPlus HD brings high definition accuracy to precise science with powerful 70mW lasers to enhance zeta potential scans. With a broad range of temperature controls, the NanoPlus HD expands analysis flexibility with protein and biological samples. This system also eliminates electro osmosis error influence and has higher sensitivity for increased raw data quality for improved results.

## Particle Insight Shape Module

The Particle Insight Shape Module is a dynamic image analyzer that utilizes your current laser diffraction workflow and is ideal for applications in which the shape is a critical physical parameter. Offering up to 30 different shape parameters, this product can analyze and report samples in either aqueous or organic solvent suspensions and operates a wide range of industrial, biological, and geological specimens from 3 µm to 300 µm. Directly integrate shape analysis into your particle size workflow with the new Particle Insight Shape Module for real-time, high resolution defined shape analysis capabilities.

## ASAP® 2060

The ASAP 2060 is an extremely cost-effective option in the Micromeritics ASAP line of instruments. This instrument provides highly reliable surface area and micropore data in a single-port, small-footprint platform. The ASAP 2060 is also equipped with both 10-mmHg and 0.1-mmHg high resolution transducers to permit krypton and micropore measurements, respectively. This instrument emphasizes affordability without compromising performance or user experience.

## MicroActive™ Share

MicroActive Share is a cloud-based application that originates from our existing software, MicroActive™ Interactive Data Analysis. This program allows multiple, simultaneous users to access and process post-run data from any web enabled device; user can also participate in discussion threads with groups or even the entire worldwide MicroActive Share Community. MicroActive Share is compatible with ASAP® 2020 Plus and 3Flex Characterization Analyzer instruments.

## Subsieve AutoSizer (Particulate Systems)

The Subsieve AutoSizer is the successor to the widely used Fisher Model 95 Sub-Sieve Sizer (FSSS) and generates "Fisher number" results with customizable Fisher correlation for data optimization. This instrument uses dual pressure transducers to measure pressure drop across a packed bed of powder and has a fully automated analysis option. The Subsieve AutoSizer offers easy-to-use automated functions together with electronically recorded data.

## AccuPyc® II 1340 TEC

The AccuPyc II 1340 TEC includes a Peltier thermoelectric device for precise temperature control and stability. This instrument is perfect for temperature sensitive or viscous samples in which environmental temperatures affect the accurate density determinations. Virtually eliminating operator error, the AccuPyc II 1340 will ensure precise results in minutes.

# Conducting Catalysis Research to Address Environmental Challenges, Can Be Enhanced by Partnering with Micromeritics®

Recent years have seen an expansion of the analytical instrument market, growing at a compound annual growth rate (CAGR) of 3.50% by 2018.[1] As the world demand for catalysts is predicted to grow at 4.8% per year to $20.8 billion in 2018, the requirements to streamline R&D, expedite time to market, and reduce publication time, has never been more important.[2] Many companies offer an array of analytical instruments, however, customers now also demand supplementary qualities such as depth of knowledge and technical expertise from their service providers to further enhance their research.


## Partnering With Micromeritics for Exceptional Technical Expertise

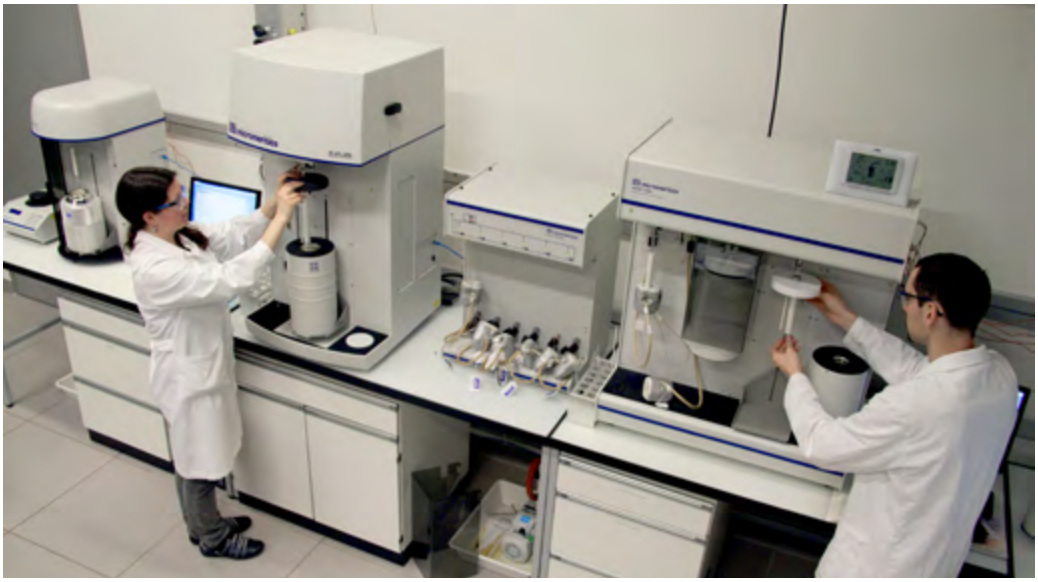
As a leader in the field of material characterization technology, Micromeritics® is dedicated to optimizing R&D and production control within industry and academia. With technical expertise that is second-to-none, and a wide spectrum of reliable high-performance instruments, customers can have complete confidence when choosing to invest and partner with Micromeritics.

One customer Dr. Alan McCue, Research Fellow at the University of Aberdeen, highlighted the importance of technical expertise, and how working with staff from Micromeritics has assisted in his research efforts.

Dr. McCue works in the team of Prof. James Anderson, exploring ways in which they can enhance the activity of relatively low cost base metals such as copper, for hydrogenation reactions. Using small quantities of a precious metal such as platinum or palladium, the aim is to improve the activity of copper catalysts, at a lower cost. For around ten years their laboratory has been using a range of Micromeritics' instruments including the PID Microactivity reactor, Tristar® and the ASAP® 2020, during which time they have developed a strong working relationship with Micromeritics. The reason for choosing to partner with Micromeritics was due to the company's in-depth technical expertise, along with the quality of the instruments and services on offer.

"Micromeritics is one of the most efficient companies that we deal with, and the technical expertise is the distinguishing factor that truly sets the company apart. If we have any questions or queries, within a couple of hours of making contact, we have a response from a technical expert and subsequently a solution," said Dr. McCue. "With every enquiry I make, I have the confidence that I am immediately speaking to an expert who knows the instrumentation inside out, and who has the extensive technical expertise to solve our queries."

There are additional benefits to working with a service provider with advanced technical knowledge. Within academia, one of the goals is to publish research findings within high impact journals to gain credit, obtain funding and grants. However, the process is extremely competitive. In 2013, of 11,000 articles submitted to Nature, only 856 (7.8%) were published, highlighting the associated challenges.[3] Data is at the heart of scientific research, and without producing excellent data to tight deadlines, you could jeopardize your chances of publication. To produce robust data, reliable instrumentation is paramount, in addition to having the support of technical experts that can help you to solve challenges that you may encounter is also just as important. Prof. Javier Pérez-Ramírez knows all too well the importance of having experts on hand



to promptly answer any technical challenges, which subsequently helps him to publish in a good time scale.

Prof. Javier Pérez-Ramírez and his research team pursue the design of heterogeneous catalysts and reactor concepts devoted to sustainable technologies. Topics of current interest include natural gas functionalization, carbon dioxide valorization, biomass to chemicals and fuels, the manufacture of specialty chemicals, and the rational understanding of catalyst scale up.

Prof. Javier Pérez-Ramírez started using Micromeritics' instruments over seventeen years ago. Owing to the reliability of the instrumentation and the extensive knowledge of the scientific team, the relationship with the company has since developed into a strong partnership. "What Micromeritics has, is an optimal balance between high-quality instrumentation and sound technical expertise", said Prof. Javier Pérez-Ramírez.

Over the years it has become clear that the partnership that has developed has offered a clear advantage to the research of Prof. Javier Pérez-Ramírez and his team. "The personnel that are employed by Micromeritics are extremely skilled, and are always striving to assist us in any way. We work together on a continuous basis and have frequent conferences to discuss joint projects, where expertise in the portfolio of techniques offered by Micromeritics bring synergies to our ongoing research, which subsequently affects our results in a positive way. The development of tools at the forefront of materials characterization helps us to undertake the most challenging projects, which in turn translates into timely and relevant research of the highest level."

## Conclusion

For individuals working within academia, the timely production of reliable and robust results is paramount, in order to draw original conclusions, and publish within high impact journals. In combination with reliable instrumentation, Micromeritics is equipped with knowledgeable technical experts that can help guide you through any challenges you may encounter, and assist in reducing time to publication.

References


1) Drug Development & Delivery. (2012). Analytical Instruments: Global Demands, Innovations & Cost-Savings. Available: http://www.drug-dev.com/Main/Back-Issues/Analytical-Instruments-Global-Demands-Innovations-524.aspx. Last accessed 15th Dec 2015.

2) Freedonia. (2014). World Catalysts. Available: http://www.freedoniagroup.com/DocumentDetails.aspx?ReferrerId=FG-01&studyid=3217. Last accessed 15th Dec 2015.

3) Gould, J. (2014). How to get published in high-impact journals: Big research and better writing. Nature Jobs Blog. http://blogs.nature.com/naturejobs/2014/11/03/how-to-get-published-in-high-impact-journals-big-research-and-better-writing/ Last accessed 15th Dec 2015.

# 2016 Grant Winners

Micromeritics grant recipients in 2015 included Dr. Michael Bartlett of the University of Georgia College of Pharmacy and Dr. Roland Pellenq of MIT's Civil and Environmental Engineering Department.

Micromeritics' Instrument Grant Program is available internationally and provides an outlet for deserving non-profit universities and research organizations to acquire state-of-the-art material characterization instruments that may not be available through other means. Types of instrumentation that qualify include particle size analyzers, gas adsorption analyzers, mercury porosimeters, gas pycnometers, and chemisorption instrumentation.

***Click here to learn more***

Michael Bartlett, Ph.D

Professor Michael Bartlett, Ph.D. has been a part of the University of Georgia's College of Pharmacy faculty for the past 19 years in which he has published 120 peer-reviewed manuscripts. He was named the College of Pharmacy Teacher of the Year in 2002 and was recognized as an AAPS Fellow in 2011. Professor Bartlett is the Editor-in-Chief of the international journal Biomedical Chromatography and is a member of the Editorial Advisory Boards of the Journal of Chromatography B and Analytical Methods.

Dr Roland Pellenq

Dr. Roland Pellenq, Ph.D. has been a MIT Senior Research Scientist for the past five years and is one of the co-founders of the Concrete Sustainability Hub, CSH@MIT, a research center dedicated to reduction of the cement and concrete industry's environmental footprint. Dr. Pellenq is also the Director of the CNRS-MIT joint laboratory and works to determine the poro-mechanical and transport properties of the most important materials in the world.

# Krypton Physisorption for Characterization of Nanoscopic Microporous Thin Films

Volumetric physisorption analysis is typically conducted using sample amounts of the order of 20 milligrams to a few grams. For smaller sample quantities and for extremely low surface area samples, the number of non-adsorbed gas molecules at adsorption equilibrium can exceed the amount of molecules adsorbed on the sample, which will hamper the accurate measurement of gas uptake by the sample. Because of this effect the typical surface area detection limit for nitrogen physisorption at 77 K is assumed to be about 1 $m^2$. This detection limit may be significantly reduced by using krypton adsorption analysis at the same temperature that for krypton is below its triple point and where its saturation pressure is 2.32 mbar i.e. ~430 times lower than psat of N2. It follows that at any given relative gas pressure the absolute pressure of krypton is 430 times lower than that of nitrogen. This also means that the density of krypton in the free space is proportionally lower, which leads to the significant improvement of detection limit for krypton.

Krypton physisorption was recently applied for the characterization of nanoscale films of the first microporous material deposited by vapor deposition.[1] The microporous metal-organic framework (MOF) thin films were conformally deposited on the nanofabricated high-aspect-ratio silicon micropillar arrays to increase the thin film quantity per sample for the measurement, while maintaining the nanoscopic thickness of the films (Fig. 1).

An accurate pore size analysis of these 100 nm thin films was conducted using krypton physisorption using a high-resolution Micromeritics 3Flex adsorption instrument. The 3Flex was equipped with high-vacuum system with three micropore-capable ports.

The adsorption isotherm plotted in Fig. 2 in a semi-log scale is a representative example of krypton adsorption isotherms measured in this study. The relative pressure of a sharp step observed in the low relative pressure range is consistent with the predicted condensation pressure of krypton in the pores of this crystalline MOF material.

Note that the gas uptake intervals of the isotherm account to merely 1 µl of krypton at STP. This resolution is enabled by the high-accuracy and low-pressure readout of the 3Flex instrument, in combination with the shift of the isotherm to low pressures enforced by the use of krypton instead of nitrogen. The amount of krypton in free space is nearly negligible in comparison to the amount of nitrogen or argon that would be present at same relative pressures.

The Brunauer–Emmett–Teller (BET) method was applied to calculate the specific surface area of the sample (Fig. 3). Taking into account the 'type I' shape of the isotherm, a linearization in a relatively low relative pressure range (0.005-0.05) was used. The suitability of this pressure range was verified in the MicroActive software by monitoring of the Rouquerol transform

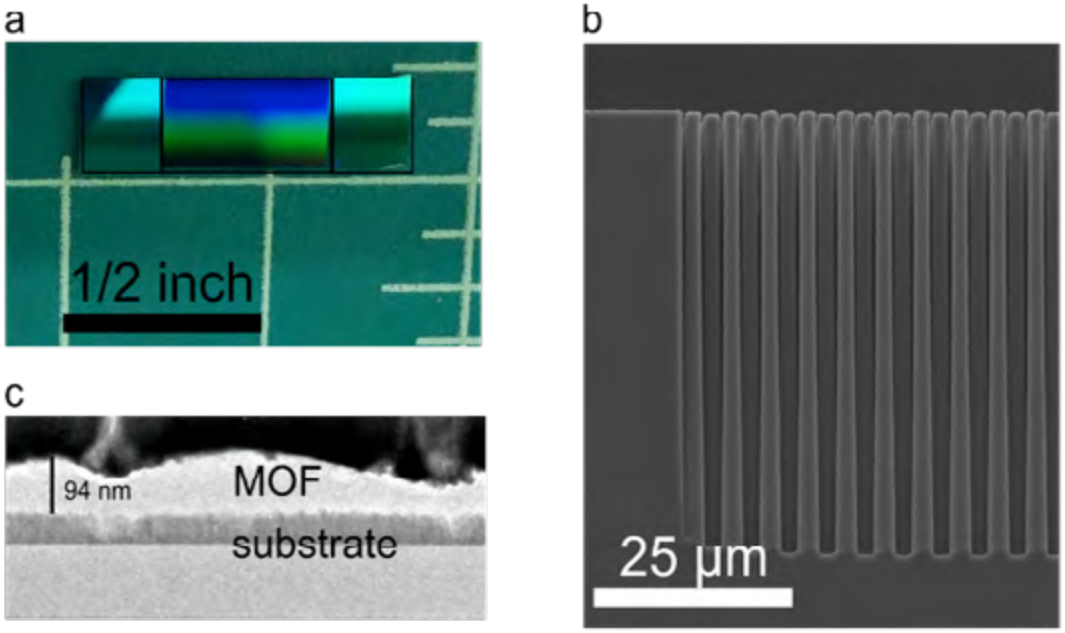



Fig. 1 Conformally deposited MOF films on high aspect ratio micropillar array. (a) Photograph of the coated array. (b) SEM cross sectional image of the coated array. (c) TEM high resolution cross sectional image of the MOF film.

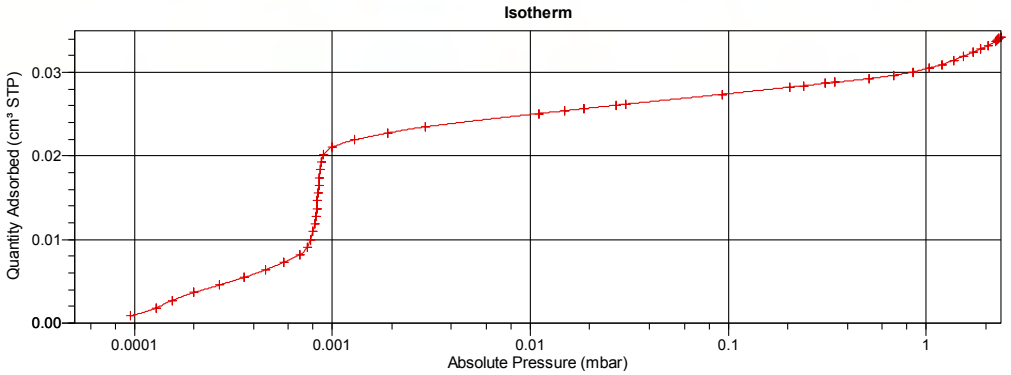



Fig. 2 Krypton adsorption isotherm measured on a 100 nm MOF film at 77 K.

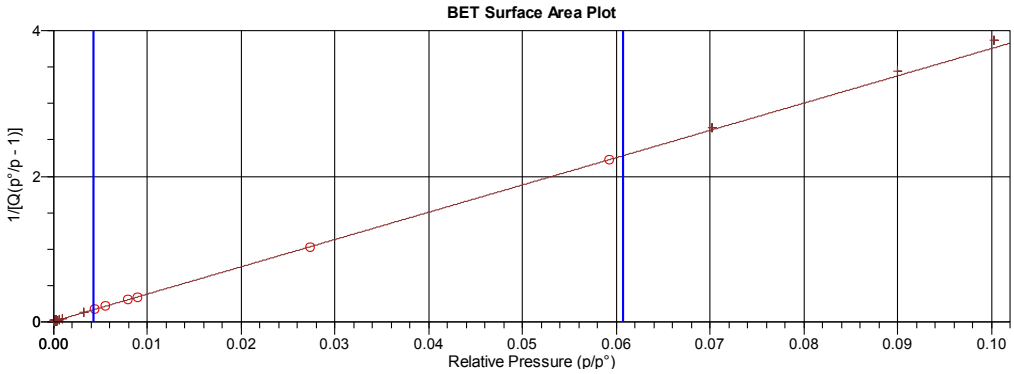



Fig. 3 BET plot of the example krypton isotherm.

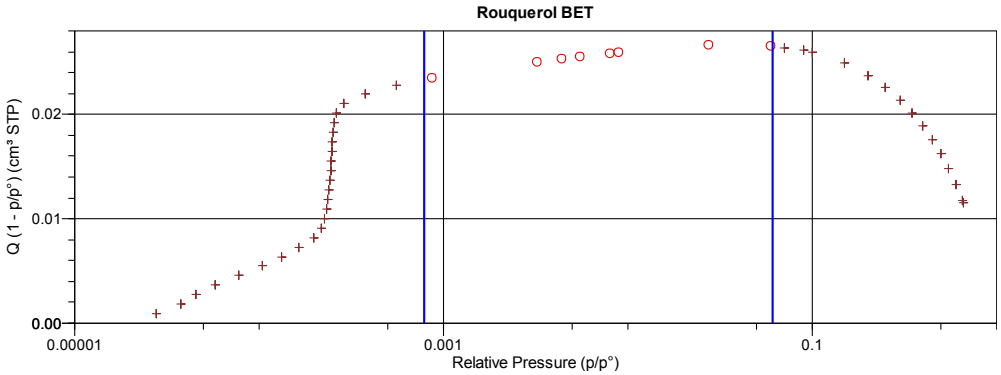



Fig. 4 Rouquerol parameter plot calculated for the isotherm in Fig. 2.

(Fig. 4). This parameter should not decrease in the range selected for linearization of the BET transform.

The BET specific surface area calculated from krypton adsorption isotherm presented in Fig. 3 was 0.15 m². This value was matched to a computational approximation of the surface area based on the crystal structure and to experimental reference measurements, to directly assess the quality of the microporous material in the nanoscopic film. Optical measurement of the film area was used to quantify the area-normalized BET specific surface area of the film. Due to the sensitivity of the measurement, 'background 'surface areas such as that of the sample tube and substrate might interfere with the result (leading to an error of a few % in the example). For this reason, the isotherm of a non-coated sample was measured in the same tube and the BET of the sample was corrected for this contribution. Using this method, average film thickness approximations could be calculated from the isotherms of different films, which corresponded well with the thicknesses measured by electron microscopy.

1. I. Stassen, M. Styles, G. Grenci, H. V. Gorp, W. Vanderlinden, S. D. Feyter, P. Falcaro, D. D. Vos, P. Vereecken, R. Ameloot, Nat. Mater. 2015, DOI 10.1038/nmat4509.

# Improved Determinations of Particle Size and Zeta Potential in Solvent-Water Blends

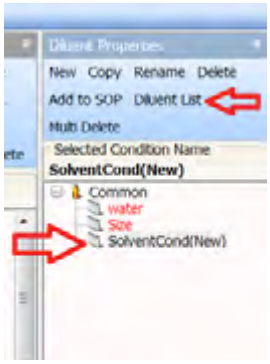
Jack G. Saad

Particle size and zeta potential are commonly used to characterize a suspension of nanoparticles. When using dynamic light scattering (DLS) for particle size or electrophoretic light scattering (ELS) for zeta potential, the value determined is based on the particles' movement through a liquid, either by Brownian motion for sizing or electrophoretic mobility for zeta potential. This means that the viscosity of the liquid must be known to calculate an accurate result. It is equally important that the refractive index of the suspending liquid is known since the size or zeta potential value is determined using light source. Additionally, zeta potential determinations are calculated based on the particles' mobility in the presence of an electric field. The strength of an electric field in a liquid is dependent on the relative permittivity, or dielectric constant, of that liquid. In order to make accurate zeta potential determinations, the dielectric constant must be known.

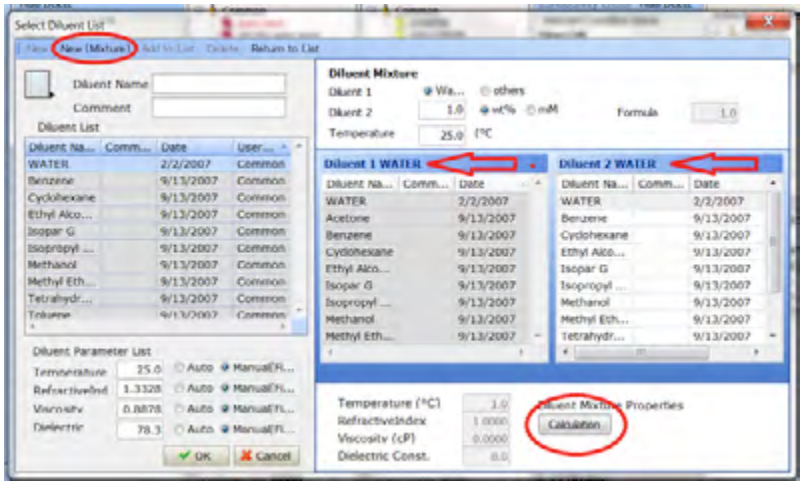
Typically, particles are suspended in pure liquid and simply using textbook values for viscosity, refractive index, and dielectric constant is sufficient. Some applications require the use of complex liquids made of solvent-water mixtures. For the most accurate results, it would be prudent to determine the viscosity, refractive index, and dielectric constant of solvent-water mixtures using the appropriate apparatus. However, to save time and in the absence of such apparatus, the NanoPlus software includes a calculator feature that generates theoretical values for viscosity, refractive index, and dielectric constant of unique medium mixtures at different temperatures.

As a guide to using this feature, follow these steps and the case study as an example.

1. Go to any SOP Designer screen and create a new Diluent Properties file. Then click on Diluent List.




2. From the Diluent list, click on New (Mixture). This will show the mixture window where you can choose Diluent 1 and Diluent 2, the amount of each, and the temperature. Once set, click on Calculation. The new parameters appear below.



## Example Case Study

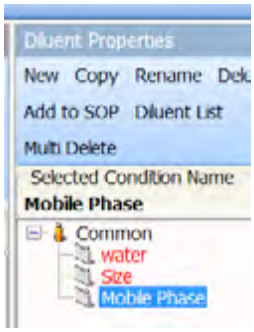
A laboratory is characterizing packing material for high-performance liquid chromatography (HPLC) columns. The most common mobile phase used in the column is composed of 5% acetonitrile, 20% methanol, and 75% water. The temperature during HPLC analysis is 50C.

The particles that make up the packing material have a new type of coating that is supposed to increase the lifespan of the column by improving retention of certain large molecules for a given period of time.

Zeta potential is a measure of stability of a suspension, as well as an indicator of surface charge or surface chemistry. The larger the absolute value of zeta potential, the more the particles will repel each other. The smaller the absolute value, the more the particles will be attracted to each other. This repulsion and attraction information can be used to monitor the quality of the coating on the packing material particles. To test the zeta potential, it is important to replicate the exact conditions in which the packing material is used by using the appropriate liquid properties so that zeta potential data is comparable.

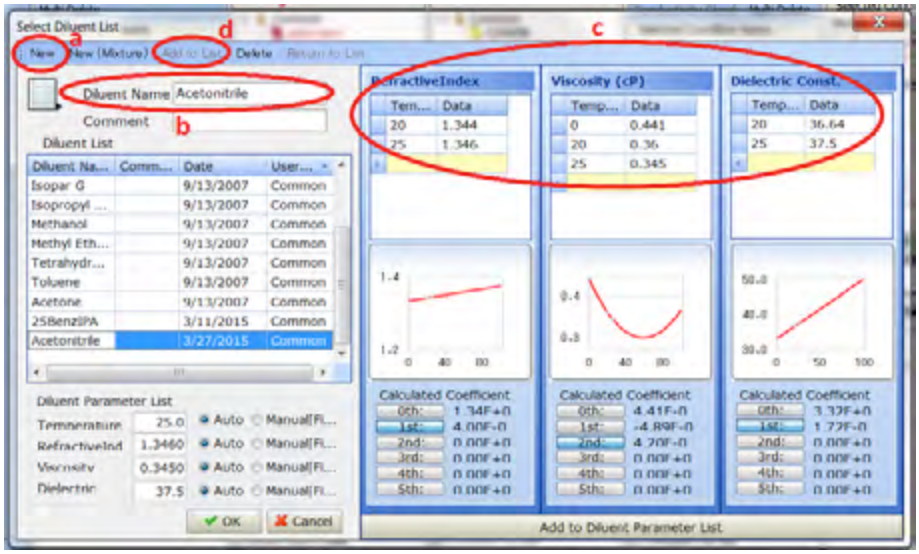
## To Create a Liquid Property for the Mobile Phase:

1. Create a new Diluent Property and name it "Mobile Phase."




2. Click on Diluent List and be sure the list includes all the liquids that need to be used in the mixture. In the case of the Mobile Phase, look for Water, Methanol, and Acetonitrile.

3. Acetonitrile is not one of the default liquids and needs to be added. To add, do the following:
   a. Click on New
   b. Enter the name of the diluent, "Acetonitrile"
   c. Enter the known properties with temperatures from literature. It is best to find properties at the temperature at which the material will be tested. The more point present, the better the interpolation or extrapolation. Click on the "Calculated Coefficient" value based on the number of points that have been entered.
   d. Click Add to List.



4. Once Acetonitrile has been added, it can be used as a pure diluent property or blended with another liquid to form a mixture. Follow the image below and

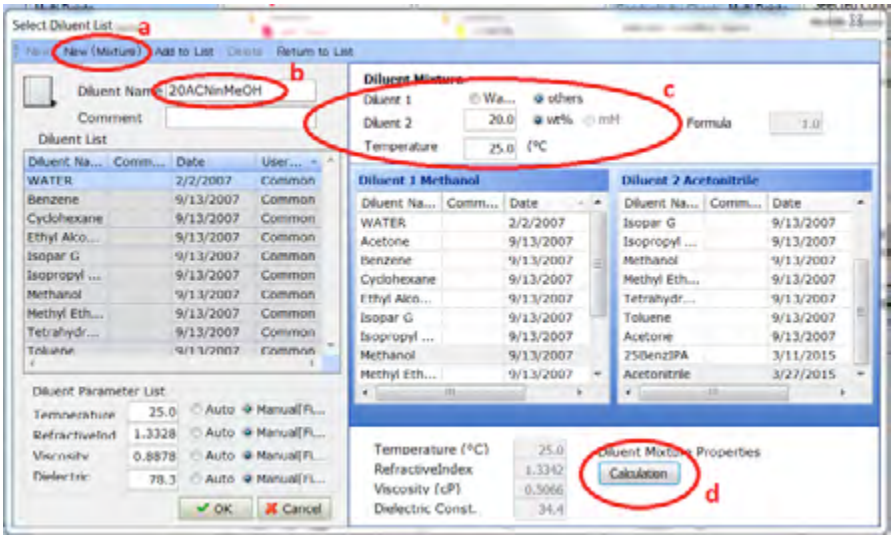
   a. Click on "New (Mixture),"

   b. Give the mixture a name,

   c. Enter the information and diluents, and

   d. Calculate the properties

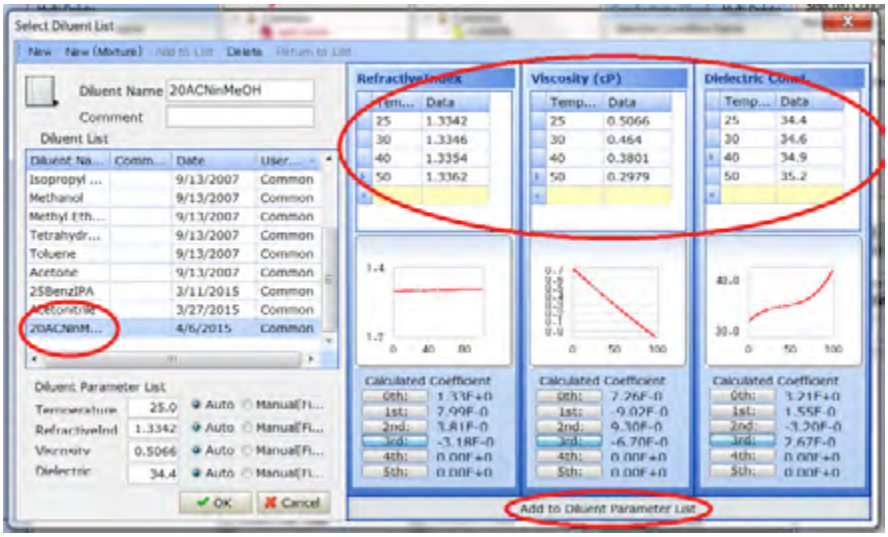
Perform this a few time and collect properties at various temperatures and document them for input during the next step. Then click "Add to List."




5. The new diluent, labeled "20ACNinMeOH", is now in the diluent list. Select it and add the other temperature points and properties documented in the previous step.

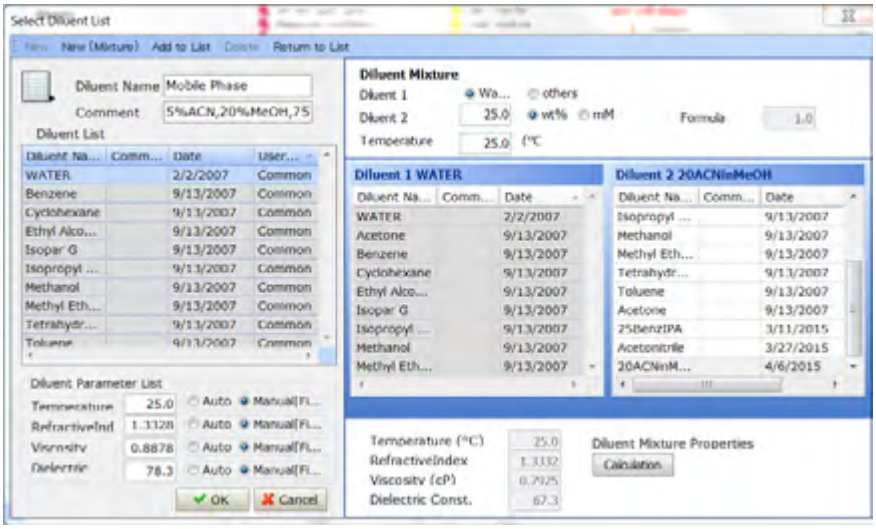
Be sure to select the appropriate "Calculated Coefficient" (In this case, four data points are entered, so "3rd Calculated Coefficient" is selected.

Click on "Add to Diluent Parameter List." Be sure that "Auto" is selected instead of "Manual (Fixed)" below.

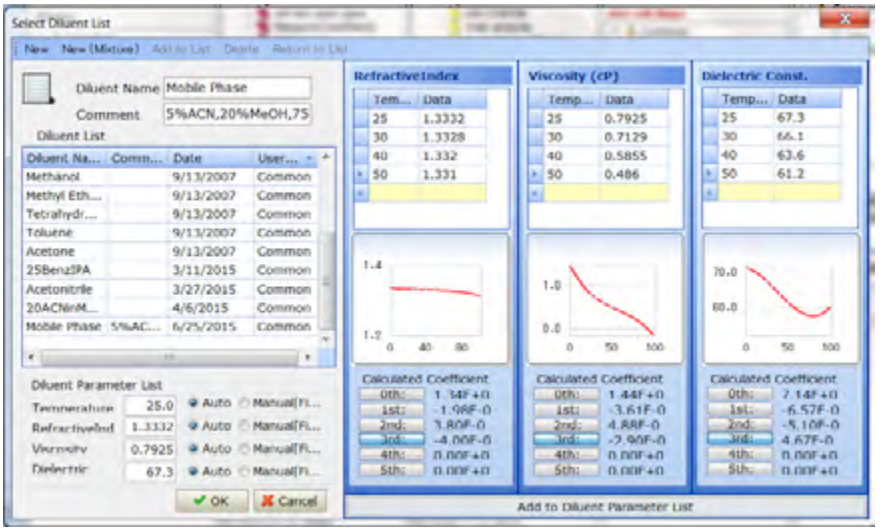


6. The properties of 20% Acetonitrile in Methanol by weight is now complete and this new diluent is now ready to be mixed with water to make a medium that is 5% Acetonitrile, 20% Methanol, and 75% Water.

   Follow the same steps as in Step 4 to create a mixture, then follow the same steps as in Step 5 to enter the calculated temperature data.




7. Once complete, select the Diluent Name "Mobile Phase" in the Diluent Properties file. It is now possible to use this diluent property to determine size or zeta potential of particles suspended in this medium at 50°C.



# Micromeritics Edu Class List

Although Micromeritics' representatives give basic start-up training for most instruments during installation, we also offer additional training courses for many of our instruments to help you maximize your proficiency and capability with your Micromeritics instrument. Micromeritics' Learning Center has national accreditation as a Post-Secondary Avocational/Professional Development Institution by the Accrediting Council for Continuing Education and Training (ACCET), an accrediting body recognized by the Unites States Department of Education. These courses help expand your ability and improve your understanding of your instrument with help from the experts.

Courses offer in-depth theory lectures by staff scientists and hands-on instrument operation with applications experts. Some topics that these courses cover are theory overview, automatic analyses, system utilities, report optimization, trouble shooting, and user maintenance.

## Customer Instrument Training Schedule

| START DATE | END DATE | COURSE TITLE |
|---|---|---|
| 01/12/2016 | 01/13/2016 | Gemini VII 2390 Basic Operator Training |
| 01/25/2016 | 01/27/2016 | AutoChem II 2920 Basic Operator Training |
| 01/28/2016 | 01/29/2016 | AutoChem II 2920 Advanced II Training |
| 02/09/2016 | 02/11/2016 | Surface Area, Porosity, & Physical Adsorption with applications in the Tristar II 3020/3030, ASAP 2420, and ASAP 2460 |
| 02/23/2016 | 02/25/2016 | SediGraph III 5120 Basic Operator Training |
| 03/08/2016 | 03/10/2016 | AutoPore IV 95XX Basic Operator Training |
| 03/11/2016 | 03/11/2016 | AutoPore IV 95XX Advanced I Training |
| 03/21/2016 | 03/23/2016 | Surface Area, Porosity, & Physical Adsorption with applications in the ASAP 2020C and 3Flex 3500 |
| 03/24/2016 | 03/25/2016 | ASAP 2020C and 3Flex 3500 Advanced II Training |
| 04/05/2016 | 04/07/2016 | Surface Area, Porosity, & Physical Adsorption with applications in the Tristar II 3020/3030, ASAP 2420, and ASAP 2460 |
| 06/06/2016 | 06/08/2016 | Surface Area, Porosity, & Physical Adsorption with applications in the ASAP 2020C and 3Flex 3500 |
| 06/09/2016 | 06/10/2016 | ASAP 2020C and 3Flex 3500 Advanced II |
| 06/20/2016 | 06/22/2016 | Saturn DigiSizer 5205 Basic Operator Training |
| 06/23/2016 | 06/24/2016 | NanoPlus Basic Operator Training |
| 07/18/2016 | 07/20/2016 | AutoChem II 2920 Basic Operator Training |
| 07/21/2016 | 07/22/2016 | AutoChem II 2920 Advanced II Training |
| 08/16/2016 | 08/18/2016 | Surface Area, Porosity, & Physical Adsorption with applications in the Tristar II 3020/3030, ASAP 2420, and ASAP 2460 |
| 09/06/2016 | 09/08/2016 | SediGraph III 5120 Basic Operator Training |
| 10/11/2016 | 10/12/2016 | Gemini VII 2390 Basic Operator Training |
| 10/25/2016 | 10/27/2016 | AutoPore IV 95XX Basic Operator Training |
| 10/28/2016 | 10/28/2016 | AutoPore IV 95XX Advanced I Training |
| 12/05/2016 | 12/07/2016 | Surface Area, Porosity, & Physical Adsorption with applications in the ASAP 2020C and 3Flex 3500 |
| 12/08/2016 | 12/09/2016 | ASAP 2020C and 3Flex 3500 Advanced II Training |

# MAS, MPS and PoroTechnology

## Micromeritics Analytical Services

Micromeritics Analytical Services (MAS) provides contract sample analyses based on the following principles: high quality results, fast turn-around-times, and outstanding customer service. Primarily equipped with products manufactured by Micromeritics, MAS also provides analytical services performed by equipment outside of Micromeritics current product line.

Services include:
- Particle Size Distribution
- Density (Skeletal or Envelope)
- High-Pressure Adsorption Isotherms
- Particle Shape
- Surface Energy
- Magnetic Content
- Particulate Count
- Dynamic Water Vapor Sorption
- Zeta Potential
- Nano Particle Size
- Thermogravimetric analysis (TGA)
- Isosteric Heat of Adsorption
- B.E.T. Surface Area
- Differential Scanning Calorimetry (DSC)
- Microscopy
- Micropore Analysis
- Active Surface Area
- Method Development
- Pore Volume Distribution
- Percent Metal Dispersion
- Method Validation
- Total Pore Volume
- Crystallite Size
- Consulting Services

All results are thoroughly reviewed by highly qualified scientists and strict confidentiality is maintained at all times.

## Micromeritics Pharmaceutical Services

MPS is your complete solution for expert particle and powder characterization. We provide clients with essential data and consultation to achieve a comprehensive understanding of material properties during drug discovery and development.

Services include:
- Particle Analysis
- Thermal Analysis
- API Characterization
- Powder Flow Properties
- Excipient Screening
- Identification of Critical Quality Attributes
- Vapor Sorption
- Batch Variability
- Surface Area
- QbD/PAT Implementation
- Surface Energy
- Consultation
- Microscopy
- Analytical Method Development/Validation

Micromeritics Pharmaceutical Services is a cGMP/GLP laboratory, registered with the FDA, and DEA licensed.

## PoroTechnology

PoroTechnology, a business unit of Micromeritics, is located in Houston, Texas and specializes in providing rock property data to the international oil and gas industry. Services include:

- Rock pore aperture down to 4 angstroms
- Pore size distribution and characterization analysis using mercury injection capillary pressure and gas adsorption techniques. Data integration possible using industry leading MicroActive software
- Mineral and clay characterization using XRD and SEM-EDS
- Clay particle size analysis using the Micromeritics advanced SediGraph III analyzer
- Dean-Stark and soxhlet extraction available

# Upcoming 2016 Tradeshows

| EVENT | DATE |
|---|---|
| ACS Spring 2016 | 03/13/2016 – 03/17/2016 |
| 49th Annual Meeting of German Catalysis – Germany | 03/16/2016 – 03/18/2016 |
| Laborama Expo 2016 – Belgium | 03/17/2016 – 03/18/2016 |
| BZA 2016 – United Kingdom | 03/21/2016 – 03/23/2016 |
| International Battery Seminar & Exhibition | 03/21/2016 – 03/24/2016 |
| Designing new Heterogeneous Catalysts – U.K | 04/04/2016 – 04/06/2016 |
| Advanced Battery Power Conference – Germany | 04/25/2016 – 04/27/2016 |
| Korea Lab 2016 | 04/26/2016 – 04/29/2016 |
| PowTech 2016 – Germany | 04/26/2016 – 04/28/2016 |
| Interphex 2016 | 04/26/2016 – 04/28/2016 |
| Ceramics Expo 2016 | 04/26/2016 – 04/28/2016 |
| KIChE 2016 - Korea | 04/27/2016 – 04/29/2016 |
| Powder & Bulk Solids 2016 | 05/03/2016 – 05/05/2016 |
| Analytica 2016 - Germany | 05/10/2016 – 05/13/2016 |
| FCCAT1 2016 – France | 05/23/2016 – 05/27/2016 |
| FOA 2016 – Germany | 05/29/2016 – 06/03/2016 |
| EGF 2016 – France | 06/01/2016 – 06/03/2016 |
| Nanotech France 2016 | 06/01/2016 – 06/03/2016 |
| 90th ACS Colloid & Surface Science Symposium | 06/05/2016 – 06/08/2016 |
| SPEA9 – Germany | 06/13/2016 – 06/17/2016 |
| IZC 2016 – Brazil | 06/19/2016 – 06/24/2016 |
| The 9th International Concrete Conference 2016 – Scotland | 07/04/2016 – 07/06/2016 |
| Nano Korea 2016 | 07/13/2016 – 07/15/2016 |
| Carbon Capture & Storage – United Kingdom | 07/18/2016 – 07/20/2016 |
| ACS Fall 2016 | 08/21/2016 – 08/25/2016 |
| ECIS 2016 – European Colloid & Interface Society Conference – Italy | 09/04/2016 – 09/09/2016 |
| Pharmsci 2016 – United Kingdom | 09/05/2016 – 09/07/2016 |
| ILMAC 2016 – Switzerland | 09/10/2016 – 09/16/2016 |
| WOTS 2016 – The Netherlands | 10/04/2016 – 10/07/2016 |
| InterBattery 2016 - Korea | 10/05/2016 – 10/07/2016 |
| IFSCC 2016 | 10/23/2016 – 10/26/2016 |
| Food Week - Korea | 11/02/2016 – 11/05/2016 |
| AAPS 2016 | 11/13/2016 – 11/17/2016 |

# Experience Material Characterization Excellence with Micromeritics


During the annual PittCon® Conference and Exhibition Micromeritics offered attendees the opportunity to Experience Material Characterization Excellence through cutting edge technology, interactive demonstrations, and one on one engagements with scientific and technical staff.

Micromeritics introduced several new innovations at the 14,000 attendee conference such as MicroActive™ Share, a cloud-based interactive tool which allows users to access and collaborate on their data from anywhere at any time.

Kiersten Chalhoub, Product Manager at Micromeritics, offered MicroActive Share demonstrations throughout the day to interested parties.

"It's really the perfect combination," Kiersten said of MicroActive Share. "We're taking the power of the current MicroActive desktop software with its robust analytical capabilities and we're pairing that with the convenience of a secure, cloud-based system. For the first time ever, as a researcher, I can not only access my data and actually work on it from anywhere with wifi but I can get help from other researchers all around the globe right from my tablet in real time."

Other introductions included the Particle Insight Shape Module from Particulate Systems, a division of Micromeritics. The Particle Insight Shape Module is designed for advancing the value of process control through integrated shape analysis as a complimentary accessory to companies existing laser diffraction systems.

"We're excited to share what we believe is the next must-have technology for today's advanced laboratories," says Peter Bouza, Area Business Manager, Micromeritics. "The Particle Insight Shape Module provides unmatched insight into subtle variations in shape which effect so many important elements–flow, abrasion, dispersion, compaction–the list goes on and on."

For more information about Micromeritics and our new product offerings visit www.micromeritics.com or www.particulatesystems.com

# Micromeritics Clients Continue to See Increasing Returns on their Analytical Instrument Investments


"As a scientific instrument manufacturer, our goal is to not just produce and supply quality analytical instruments which return tangible value to our clients. We seek to be a strategic business resource with whom our clients consult to address their most critical issues," says Jeff Sherman, VP of Business Development, Micromeritics Instrument Corp.

The results of a survey from an independent, third party research firm, TechValidate, indicate that over half of the 606 respondents are taking full advantage of that value. 90% of the respondents reporting an improvement in their scientific results (TVID: 3C4-5BE-017) and 90% experiencing an improvement in the interpretation of the data (TVID:1AB-1B2-4CC).

William Carty, Professor and Chair of Ceramic Engineering, Alfred University describes his experience with Micromeritics instruments as, "reliable, easy to use, and good technical service when necessary." (TVID: 0B6-61A-C1F)

"The relationship we strive to achieve with our clients goes beyond providing an extraordinary instrument. We're focused on providing a whole-solution approach to our customers, creating mutual success for both parties," says Alisa Moloney, Marketing Manager, Micromeritics Instrument Corp.

While the survey results show that product quality and reliability (62%) were key factors in their choice to buy Micromeritics, 41% of the respondents also reported strong satisfaction with their on-going relationship with Micromeritics as a key factor driving their decision to buy again and again (TVID: 636-FE1-E3F). This strategic relationship with our clients really makes our coworkers proud to be a part of the Micromeritics world-wide team.

"It's seeing this type of feedback that makes what we do here really worthwhile," Adrian Gibson, Director of Manufacturing, Micromeritics Instrument Corp. states. "I've been a part of Micromeritics for 25 years. When I see this, I know we're making a difference."

Stephen Polgar, Quality Director at Asbury Carbons, Inc. recommends Micromeritics based on this very reason. "We've had a great experience using them for over the past 20+ years. It allows us better characterization of our products." (TVID: 190-F9B-408)

For more information about Micromeritics or to view more survey responses visit www.micromeritics.com/testimonials

# How To Reach Us

Micromeritics has over 70 sales, service, and distribution offices throughout the world. For additional information, a free product demonstration, or the location of the office nearest you, call or write:

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