

Directory

Powder & Porous Materials Characterization Methods

SURFACE AREA

- ▶ BET, 1-point, N₂
- ▶ BET, multi-point, N₂
- ▶ BET, multi-point, Kr
- ▶ NSA, see BET
- ▶ STSA, multi-point, N₂
- ▶ Micropore, t-plot method

PORE SIZE

- ▶ Micropore, Ar/87K (zeolites)
- ▶ Micropore, CO₂/273K (carbons)
- ▶ Micropore, N₂/77K
- ▶ Mesopore, N₂/77K
- ▶ Mesopore, Ar/77K
- ▶ Mesopore, Ar/87K

PORE VOLUME

- ▶ Gas adsorption, 0.3nm to 500nm pore diameter
- ▶ Mercury intrusion, -3.5nm to 900µm

DENSITY

- ▶ True/skeletal, gas pycnometer
- ▶ Open/closed, gas pycnometer
- ▶ Geometric/envelope, powder pycnometer
- ▶ Tapped density
- ▶ Hausner ratio
- ▶ Carr's index

CHEMISORPTION

- ▶ Active metal area
- ▶ Nanocluster size
- ▶ Catalyst dispersion
- ▶ TPR/TPD/TPO
- ▶ Optional mass spectrometry

VAPOR SORPTION

- ▶ Water
- ▶ Alcohols
- ▶ Aromatics
- ▶ Other hydrocarbons

ZETA POTENTIAL

- ▶ ZP valve & photomicrograph
- ▶ Isoelectric point

PARTICLE SIZE

- ▶ Dry powder
- ▶ Liquid suspensions

FOR MORE INFORMATION:

Please avail yourself of the easy access to our experts if you are at all unsure as to exactly what to request. Contact us at qc.lab@quantachrome.com or visit us on our website at www.labqmc.quantachrome.com



LABORATORY DIRECTORY: Application Measurement Services

by: **Martin A. Thomas Ph.D.**, Director of Business Development
Quantachrome Instruments (martin.thomas@quantachrome.com)

Quantachrome understands that not everyone can purchase an instrument for their porous materials characterization, and that they would rather turn to an experienced laboratory to perform the measurements for them. Welcome to Quantachrome's Application Laboratory whose staff not only has the experience but also the expertise you need for meaningful powder and porous materials characterization. An initial consultation, always free-of-charge, ensures the best test method will be used so that you will receive results that both make scientific sense and that have practical use. When the results are ready, they are sent electronically or faxed, with a hardcopy mailed out if you prefer - again at no extra charge. And, being a customer-oriented company, we will help you interpret the data. Most of the individual measurements that we offer are listed at left, and described briefly below. If you do not see what you need, or need more information, including a competitively priced, up-to-date fee schedule, please do not hesitate to contact the Application Laboratory staff.



SURFACE AREA MEASUREMENTS

Samples are outgassed under vacuum or inert gas purge, usually at some elevated temperature. If your samples are heat or light sensitive, do not worry, just let us know and we will take appropriate care. The surface area is measured by nitrogen adsorption or, in the case of very low surface areas (say less than 1m² total available area), by krypton adsorption, both at liquid nitrogen temperature.

PORE SIZE, PORE VOLUME MEASUREMENTS

Micropores (i.e. those of molecular size) are analyzed by gas adsorption at very low pressures on state-of-the-art high vacuum systems. Resulting data are appropriately processed by the largest commercially available range of advanced computation methods. Large macropores (i.e. over 0.5 microns, and upto ~900 µm diameter) are analyzed by the forced intrusion of liquid mercury. And we take care of mercury disposal concerns. Pores of intermediate size (mesopores) may be characterized by either gas sorption or mercury porosimetry. We will gladly discuss your application and make suitable suggestions as to which method is more appropriate.

DENSITY DETERMINATIONS

True (skeletal) density is determined by automatic gas-expansion pycnometer so there are no solubility issues as might be encountered with liquid pycnometers. A variety of gases are available, including (but not limited to) helium, nitrogen, argon, carbon dioxide, sulfur hexafluoride. The correct selection is made according to sample type (mineral, vegetable, etc). Gas pycnometry is also used for open/closed cell determination of polymer foams. Tapped density, a space-filling property of bulk powders, is reported not as one single value, but as the trend according to number of taps. Hausner Ratio and Carr's Index (both indicators of flow and compressibility properties) are reported at no additional charge.

Dry powder pycnometry is used to determine geometric (envelope) volume/density of irregular pellets, granules etc.

CATALYST CHARACTERIZATION

Chemisorption methods are the dominant techniques used. Isotherms of reactive gases such as hydrogen and carbon monoxide are used to calculate active metal area, nanocluster size and dispersion. Temperature programmed analyses such as TPR, TPO and TPD (with or without on-line mass-spectrometer) are routinely done for reducibility studies, profiling carbon species and acid site strength. You are invited to consult with our experts as to what we can do for you.

VAPOR SORPTION STUDIES

Water sorption isotherms are popular with manufacturers of processed foods, pharmaceuticals, fuel-cell components, desiccants and construction materials. It also offers a unique way to characterize nanoporous carbons. A wide range of other polar, and non-polar, solvents can be employed for specific vapor-solid studies. What do you have in mind? ■

For more information about measurement capabilities and how to submit a sample, contact LabQMC by phone: (561) 731.4999, email: qc.lab@quantachrome.com or visit www.labqmc.quantachrome.com