



Characterizing Porous Materials and Powders

2010
Analytical Services

| Part number | Measurement | Description |
|-------------|--------------------------------|---|
| 06000-1N | Single-Point BET with Nitrogen | Single-point BET specific surface area ($P/P_o = 0.3$) by nitrogen adsorption at 77K. Dynamic flow method unless otherwise requested. Requires minimum 1m^2 surface area. Customer provides outgassing (preparation) temperature. |
| 06000-3N | Multi-Point BET With Nitrogen | Multi-point BET specific surface area by nitrogen adsorption at 77K (minimum 3 data points). Vacuum/volumetric method. Includes single-point BET value at $P/P_o = 0.3$. Report includes both graphical and tabular multi-point result with BET C constant and correlation coefficient. Requires minimum 1m^2 surface area. Customer provides outgassing (preparation) temperature. |
| 06000-1K | Single-point BET with Krypton | Single-point BET specific surface area ($P/P_o = 0.3$) by krypton adsorption at 77K. Vacuum/volumetric method unless otherwise requested. For surface areas less than 1m^2 . Customer provides outgassing (preparation) temperature. |
| 06000-3K | Multi-Point BET with Krypton | Multi-point BET specific surface area by krypton adsorption at 77K (minimum 3 data points). Vacuum/volumetric method. Includes single-point BET value at $P/P_o = 0.3$. Report includes both graphical and tabular multi-point result with BET C constant and correlation coefficient. For surface areas less than 1m^2 . Customer provides outgassing (preparation) temperature. |
| 06000-CB | STSA Carbon Black Surface Area | External surface area of carbon blacks by nitrogen adsorption at 77K (minimum 3 data points). Vacuum/volumetric method. Includes multi-point BET value and single-point BET value at $P/P_o = 0.3$. Report includes both graphical and tabular STSA & multi-point BET results. Customer provides outgassing (preparation) temperature. |
| 06001-T | t-plot Micropore Area | Micropore surface area and micropore volume by nitrogen adsorption at 77K (minimum 3 data points). Vacuum/volumetric method. Includes multi-point BET value and single-point BET value at P/P_o . Report includes both graphical and tabular t-plot & multi-point BET results. Customer provides outgassing (preparation) temperature. |

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| 06000-L | Langmuir Surface Area | Multi-point Langmuir specific surface area by nitrogen adsorption at 77K (minimum 3 data points). Vacuum/volumetric method. Includes multi-point BET value (if appropriate) and single-point BET value at $P/P_0 = 0.3$. Customer provides outgassing (preparation) temperature. |
| 06000-DR | DR Micropore Area with Nitrogen | Dubinin-Radushkevich micropore surface area and micropore volume by nitrogen adsorption at 77K (minimum 3 data points). Vacuum/volumetric method. Report includes both graphical and tabular DR, t-plot & multi-point BET results. Customer provides outgassing (preparation) temperature. |
| 06000-3C | Extended DR Micropore Analysis with Carbon Dioxide | Extended Dubinin-Radushkevich micropore surface area and micropore volume by CO_2 adsorption at 273.15K. Vacuum/volumetric method. Report includes both graphical and tabular DR & DFT micropore size distribution results. Suitable for carbon samples. Customer provides outgassing (preparation) temperature. |
| 06001-P | Total Pore Volume with Nitrogen | Total pore volume and average pore size by nitrogen adsorption at 77K. Vacuum/volumetric method. Includes multi-point BET area. Customer provides outgassing (preparation) temperature. |
| 06001-20-AD | Standard Mesopore Analysis | Standard Mesopore Analysis by nitrogen adsorption at 77K. Vacuum/volumetric method. 20 adsorption points plus 19 desorption points. Includes BET multi-point value, single-point at $P/P_0 = 0.3$, t-plot calculation and total pore volume. Report includes both tabular and graphical BJH pore size distribution, BET and t-plot results. Customer provides outgassing (preparation) temperature. |
| 06001-40-AD | High Resolution Mesopore Analysis | High resolution mesopore analysis by nitrogen adsorption at 77K. Vacuum/volumetric method. 40 adsorption points plus 39 desorption points. Includes BET multi-point value, single-point at $P/P_0 = 0.3$, t-plot calculation and total pore volume. Report includes both tabular and graphical BJH pore size distribution, BET and t-plot results. Customer provides outgassing (preparation) temperature. |

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| 06001-MS | Standard Micropore & Mesopore Analysis | Standard micropore and mesopore analysis by nitrogen adsorption at 77K. vacuum/volumetric method. 64 adsorption points plus 19 desorption points. Includes multi-point BET area, total pore volume, and average pore size. Pores size distribution reports can also include adsorption and desorption isotherms, cumulative and differential pore volume and/or area distributions vs. pore diameter. Optional data reduction calculations (available upon request) include BJH, DH, DA, HK, SF, fractal dimension and DFT methods. Customer provides outgassing (preparation) temperature. |
| 06001-MH | High Resolution Micropore & Mesopore Analysis | High resolution micropore and mesopore analysis with nitrogen. Includes multipoint BET area, total pore volume, and average pore size. Pore size distribution reports can also include adsorption and desorption isotherms, cumulative and differential pore volume and/or area distributions vs. pore diameter. Optional data reduction calculations (available upon request) include BJH, DH, DA, HK, SF, fractal dimension and DFT methods. Customer provides outgassing (preparation) temperature. |
| 06001-H2O | Water Sorption Isotherm | Adsorption/desorption isotherm of water sorption at user specified temperature (12-80 degC). Vacuum/volumetric method. 20 adsorption points plus 19 desorption points. Includes BET multi-point value. Report includes both tabular and graphical results. Customer provides outgassing (preparation) temperature. |
| 06001-H2O-H | Heat of Adsorption Vacuum/Volumetric Method | Heat of adsorption measurements using vacuum/volumetric method. Analysis performed at 2 different temperatures to calculate isosteric heats of adsorption. Report includes tabular and graphic isotherms. Customer will provide information regarding outgassing and analysis temperatures. Please call for quote if analysis required at more than 2 temperatures. |
| 06001-H2O-DVS | Gravimetric Water Sorption Isotherm | Adsorption/desorption isotherm at user specified temperature (10 -70 degC). Gravimetric water vapor sorption analysis, 20 adsorption points plus 19 desorption points. Report includes both tabular and graphical results. Customer provides outgassing (preparation) temperature. Standard results also includes kinetic data. |

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| 06001-H ₂ O-DVS-H | Heat of Adsorption using Gravimetric Water Sorption | Heat of adsorption measurements using gravimetric water sorption analyzer. Analysis performed at 2 different temperatures to calculate isosteric heats of adsorption. Report includes tabular and graphic isotherms. Customer provides information regarding outgassing and analysis temperatures. Please call for quote if analysis required at more than 2 temperatures. |
| 06007 | Standard Chemisorption | Standard chemisorption analysis with H ₂ , O ₂ , CO, CO ₂ , or NH ₃ . Includes combined, weak and strong isotherms for determination of monolayer uptake. Report includes tabular and graphical isotherms, monolayer uptake, active metal surface, metal dispersion (%), and crystallite size. Customer provides reduction (preparation) temperature and metal loading (%) for dispersion and crystallite size calculations. |
| 06007-H | High Resolution Chemisorption | High resolution analysis chemisorption analysis with H ₂ , O ₂ , CO, CO ₂ , or NH ₃ includes additional low pressure data. Includes combined, weak and strong isotherms for determination of monolayer uptake. Report includes tabular and graphical isotherms, monolayer uptake, active metal surface, metal dispersion (%), and crystallite size. Customer provides reduction (preparation) temperature and metal loading (%) for dispersion and crystallite size calculations. |
| 06007-C | Customized Chemisorption | Customized analysis, including pulse chemisorption and/or TPR/TPD (Temperature Programmed Reduction/Desorption). Multiple temperature runs to calculate activation energy and/or energy of desorption. Each run counts as one analysis. Comprehensive report provided with calculated activation energy/energy of desorption. Alternatives include at least three runs on a vacuum/volumetric system for purposes of determining isosteric heats of adsorption. Customer provides reduction (preparation) temperature. |

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| 06003 | True (Skeletal) Density by Gas Pycnometry | Standard procedure determines true density of sample using helium pycnometry and reports average of at least three runs (tabular format only). Nitrogen is recommended for low density polymers (<1g/ml) and samples of vegetable origin. |
| 06003-A | Foam Open/Closed Cell by Nitrogen Pycnometry | Open/closed cell percentages of foam polymers (cellular plastics) using nitrogen, uncorrected for cut sample. Corrected open/closed cell percentage using method ASTM D6226 (Appendix XI, procedure 2) is considered as two analyses. The customer is expected to provide initial 1 inch (2.54cm) cube sample for analysis. Extra charge for sample preparation. |
| 06003-C | Foam Compressibility by Nitrogen Pycnometry. | Compressibility of foam sample using nitrogen pycnometry over approximate pressure range 2 psig to 20 psig. Tabular report includes % volume change as a function of initial pressure plus uncorrected open/closed cell percentages. |
| 06003-F | Foam Fracture and Compressibility by Nitrogen Pycnometry. | Volume % cell fracture of foam sample by nitrogen pycnometry over approximate pressure range 2 psig to 20 psig. Tabular report includes % volume change as a function of initial pressure. |
| 06004 | Tap Density | Tapped bulk density of powder or coarse particles using 1/8" drop height. Bulk volume recorded every 500 taps until no further observable change in the level of powder in the calibrated cylinder. Tabular report gives tapped bulk volume and density of the sample as a function of number of taps. Analysis can also be performed to ASTM standard specifications upon request. |
| 06004-D | Envelope (Geometric) Density by Dry Powder Pycnometry | Envelope density of sample determined using a free flowing powder. Usually used for irregular forms/shapes. |

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| 06005 | Pore size by Mercury Intrusion and Extrusion | Pore volume and size distribution by mercury intrusion and extrusion (to 33,000/60,000 psia or user requested pressure). Report includes total pore volume, total surface area, mean, median and modal pore sizes, cumulative and differential pore volume and/or area distributions. Both graphical and tabular reports will be provided. Optional data reduction calculations (upon request and where appropriate) include compressibility, fractal dimension, throat/pore ratios, permeability, tortuosity, particle size distributions. |
| 06005-D | Envelope (Geometric) Density by Mercury Porosimeter | Envelope (geometric) density by mercury displacement after evacuation. Envelope density reported at fill pressure (bulk density) and at 1 atmosphere (apparent density). Price includes proper disposal of mercury contaminated sample. |
| 06005-A | Mercury Contact Angle | Contact angle of mercury on sample using a dynamic mercury contact angrometer. Result is reported as average of three measurements. |
| 06005-PD | Pore Size Distribution and Density by Mercury Intrusion. | Determine pore size by mercury intrusion and extrusion (to 33000/60000 psia or user requested pressure). Report includes total pore volume, surface area, and pore size distribution. Data reduction calculations can include cumulative and differential pore volume and/or area distributions vs. pore diameter or pressure. Both graphical and tabular reports will be provided. Optional data reduction calculations (upon request) include compressibility, fractal dimension, throat/pore ratios, permeability, tortuosity, Mayer-Stowe and Smith-Stermer particle size distributions. Also, includes determining the envelope density by mercury fill. |

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Priority Service: Results will be faxed within three working days after receipt of samples, purchase order and necessary instructions for an additional fee of 75% of standard price. Surcharges will be waived if the analysis is not completed within three working days

MSDS should be included with the samples. Special handling requirements must be specified.

Educational Discount: Available to academic institutions. Call for quotation.

Volume Discount: May be applied for a quantity greater than five samples. Call for quote.

Return Fee: Samples will automatically be returned to customer at no extra charge by US mail 30 days after results have been reported. Additional charges may be incurred if samples require special shipping requirements.

Instrument Purchase Credit: Up to 50% of analysis charges, not to exceed 5% of the instrument price, may be credited toward the purchase of Quantachrome instruments. To receive the credit, instrument must be purchased within 120 days of analysis completion date.

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