Application Note 98

Diversity of Applications of the GeoPyc 1360

The GeoPyc® 1360 measures the envelope density (sometimes called bulk density) of rigid and semi-rigid, porous materials. Unlike absolute density, which excludes the volume of pores and small crevices, envelope density is the mass of an object divided by its volume including the pore volume. When the sample's absolute density (sometimes called skeletal, true, or real density) is supplied, the GeoPyc automatically calculates the sample's percentage total porosity and specific pore volume. (Absolute density can be obtained using Micromeritics' AccuPyc™ 1330.)

The GeoPyc uses a dry-fluid medium — called Dry*Flo*® — to measure the sample's volumetric displacement. Because Dry*Flo* conforms to sample surfaces without entering pores, irregularly-shaped samples and even samples comprised of multiple objects can be analyzed.

Unlike other methods, such as mercury intrusion and hot-wax dipping, the GeoPyc 1360 method is generally non-destructive of the sample, rapid, easy to perform and involves no handling or disposal of hazardous materials.

The GeoPyc completes density analysis and automatically prints a report in 5 to 20 minutes, depending on user-selected parameters. This rapid sample turnaround makes the GeoPyc an ideal quality control tool for many industries. Reducing analysis time and/or analyzing a larger percentage of samples means that production can respond more effectively to quality standards, whether the goal is to maximize the porosity of catalyst substrate or to minimize the porosity of powdered metal objects.

The GeoPyc could be most useful, however, when a constant level of product porosity must be maintained within narrow specifications. The GeoPyc's method facilitates quick identification and correction of changes in product porosity. The simple technique and fully-automated process are designed to minimize human error.

The GeoPyc is also convenient for most labs because it is quiet and compact, and requires only an electrical supply (no gases or liquids).

A variety of materials ranging from highly porous to nonporous can be analyzed. A sampling of materials with typical results is shown in Table 1.

The tests giving these results were performed on prototype instruments to demonstrate the GeoPyc's capability. The tabulated information is believed to fairly represent the great range of applicability and utility of the GeoPyc 1360.

micromeritics®
One Micromeritics Drive, Norcross, Georgia 30093
T. (770) 662-3620 www.micromeritics.com

Table 1.Typical Results

Sample Identification	Envelope Density (g/cm^3)	Porosity (%)	Specific Pore Volume (cm^3/g)
Stone Fragments	2.469	9.39	0.038
Stone Fragments	2.096	21.54	0.103
Stone Fragments	2.562	5.35	0.021
Polyethylene Foam	0.032	94.10	28.98
Copper Chromite Catalyst	1.985	52.03	0.262
Copper Chromite Catalyst	1.497	62.25	0.416
Powdered Metal Bronze Bearing	7.012	15.81	0.023
Carbonized Fabric	1.374	14.99	0.100
Cast Refractory	2.894	22.24	0.080
Fired Ceramic	1.947	28.77	0.148
Clay Brick	2.251	13.09	0.058
Sintered Metal Part	5.384	28.92	0.054
Porous Plastic	0.552	41.08	0.744
Alumina Abrasive	3.592	8.05	0.022
Silica Cracking Catalyst	1.099	48.59	0.442
Clay Extrudate, Unfired	1.897	28.77	0.152
Clay Extrudate, Fired	2.279	5.66	0.025
Geologic Formation	2.514	6.91	0.027
Geologic Formation	2.702	0.72	0.003
Alumina Catalyst Substrate	1.053	66.85	0.625
Aerogel	0.146	93.04	6.386
Nylon Molding Resin	1.103	2.90	0.026
Compacted Sodium Chloride	2.103	2.34	0.011
Powdered Metal Spur Gear	6.953	10.97	0.016
Resin-Carbon Fiber Composite	1.497	3.68	0.025
Bauxite Granules	3.343	6.09	0.018
Periclase (Mg0) Granules	3.382	2.33	0.007
Activated Carbon	0.646	68.06	1.053
Ferrite	3.938	46.12	0.117
Ceramic Granulate (Red)	1.944	28.87	0.148
Clay Tile	2.491	0.132	0.001
Resistor Ceramic	3.733	1.500	0.004
Rock Core	2.362	13.10	0.055
Rock Core	2.080	21.78	0.105
Space Shuttle Tile	0.230	89.90	3.902
Tantalum Anode	8.284	42.74	0.052
Pelletized Iron Oxide	3.732	19.88	0.053
Sintered Carbon Shape	1.275	19.92	0.156
Sintered Bronze	7.300	14.71	0.020
Ferrite (Green)	2.850	42.01	0.147
Milk Sugar - Cellulose Pellets	0.815	41.11	0.504
Pharmaceutical Tablets	1.185	33.06	0.279