

# HPVA

## High Pressure Volumetric Analyzer

### Features

- *Pressure Ranges from vacuum to 200 bars*
- *Temperatures from cryogenic to 500 °C. Excellent control of sample temperature by means of a constant temperature bath*
- *Fully automated analysis and sample evacuation*
- *Excellent data reproducibility*
- *Handles typical adsorbates such as Nitrogen, Hydrogen, Methane, Argon, Oxygen, Carbon Monoxide, and Carbon Dioxide*
- *Comprehensive Data Analysis Package using Microsoft® Excel® macros for data processing and graphing*
- *Software includes NIST RefProp Database 23*
- *Solid-state pressure transducers with silicon element mounted to a hastelloy isolation diaphragm with a high-integrity glass-to-metal seal*



## HPVA-100 and HPVA-200

The HPVA Series of gas adsorption analyzers from Particulate Systems is designed to obtain high-pressure adsorption isotherms using gases such as hydrogen, methane, and carbon dioxide using the static volumetric method.

The volumetric technique consists of introducing (dosing) a known amount of gas (adsorptive) into the

chamber containing the sample to be analyzed. When the sample reaches equilibrium with the adsorbate gas, the final equilibrium pressure is recorded. These data are then used to calculate the quantity of gas adsorbed by the sample. This process is repeated at given pressure intervals until the maximum preselected pressure is reached. Each of the resulting

equilibrium points (volume adsorbed and equilibrium pressure) is then plotted to provide an isotherm. Excellent reproducibility and accuracy are obtained by using separate transducers for dosing the sample and for monitoring the pressure in the sample chamber.

#### Characterizations for:

Catalysts  
Zeolites  
Activated Carbons  
Carbon Nanotubes  
Hydrides

#### Materials for:

Hydrogen and NG Storage  
Fuel cells and batteries  
Stack gas scrubbers  
Hydrocarbon traps  
CO<sub>2</sub> sequestration

# HPVA High Pressure Volumetric Analyzer

Models HPVA-100 and HPVA-200

## Components

### Manifold

All the valves in the manifold are pneumatically operated high-pressure valves. All valve connections are made with heavy-wall 316L stainless steel, and are either welded or use VCR or VCO connections. All gas lines are fitted with 60  $\mu\text{m}$  in-line filters. The manifold is leak-tested to  $10^{-9}$   $\text{cm}^3$  atm/sec.

### Pressure Transducer

The pressure transducers are a high-precision, solid state design with a silicon strain gauge mounted to a hastalloy diaphragm. The advanced design is fully encapsulated thus ensuring the integrity of the element. Pressure reading accuracy is  $\pm 0.04\%$  full scale with a stability of  $\pm 0.1\%$ .

### Vacuum System

Consists of a 5-CFM mechanical pump and Pirani vacuum gauge. A high vacuum Turbo or Molecular Drag pump option is available.

### Constant Temperature Bath

The operator-selected analysis temperature for the sample is maintained constant by the refrigerated circulation vessel. This recirculation fluid connection allows attachment to standard lab recirculation baths. (Customer supplied)

### Sample Prep Port

The HPVA Analyzer includes a separate activation port for drying or activating the sample before testing. VCO connectors are used to attach the sample holder to the degas port. A helium line is also provided for backfilling the sample holder. The furnace is capable of temperatures up to 500  $^{\circ}\text{C}$ , controlled with a PID routine which includes ramp and soak capabilities.

### Safety Features

To protect the user, the HPVA includes a hydrogen gas sensor to detect excessive levels of  $\text{H}_2$  gas should a leak in the system occur. If tripped, the safety circuit places the HPVA unit in a safe condition by removing power to the unit and opening the vent valve to allow the gas to be safely vented.

