

TGA-HP

The TA Instruments TGA-HP Series instruments are specialty gravimetric analyzers designed to provide unique capabilities for High-Pressure, Ultra-High Vacuum, and High-Temperature under static or dynamic reactive atmospheres.

The TGA-HP 50 is our standard system, employing a high-sensitivity balance in a robust design. The TGA-HP 50 can accommodate samples up to 5 g in mass, with a sensitivity of 0.5 microgram. The TGA-HP 50 is the instrument of choice for high-pressure studies (up to 50 Bar) at measurement temperatures up to 800°C, and can accommodate a variety of gas compositions under static or high-pressure dynamic flow. The standard vacuum accessory provides for measurement at reduced pressures down to 1×10^{-3} torr; our optional Ultra High Vacuum (UHV) accessory can provide atmospheres down to 1×10^{-6} torr.



When higher pressures or corrosive gas atmospheres are required, the TGA-HP 150 is recommended. This top-of-the-line model provides pressures up to 150 Bar, and utilizes an advanced Rubotherm Magnetic Suspension balance with a 25 g capacity. This allows the reaction chamber to be completely sealed, allowing for aggressive gas chemistry while isolating the microbalance assembly. The TGA-HP 150 can be operated up to 750°C at the maximum pressure, and comes equipped with the standard vacuum accessory for low-vacuum studies. The optional UHV accessory is also available for studies under atmospheres down to 1×10^{-6} torr.

Technical Specifications

	TGA-HP 50	TGA-HP 150
Balance	Standard Balance	Rubotherm Magnetic Suspension
Maximum Sample Weight	5 g	25 g
Dynamic Range	500 mg	25 g
Weighing Accuracy	+/- 0.1%	± 0.0002%
Weighing precision	+/- 0.01%	±30 µg
Sensitivity	0.5 µg	10 µg
Upper Temperature Limit		
pretreatment	1000°C	1000°C
testing	800°C	750°C
Pressure Limit	50 bar (725 PSI)	150 bar (2175 PSI)
Vacuum	1×10^{-3} torr	1×10^{-3} torr
Optional High Vacuum	1×10^{-6} torr	1×10^{-6} torr
Atmosphere		corrosive gases
		inert
		water vapor
		organic vapors
		hydrogen
		methane
		carbon dioxide
		permanent gases

The TA Instruments TGA-HP Series of gravimetric analyzers are designed for sorption studies using water vapor, organic vapors, hydrogen, methane and carbon dioxide as well as permanent gases and corrosive gases.

The TGA-HP analyzer provides adsorption and desorption isotherms for the evaluation of catalysts, zeolites, activated carbons, carbon nanotubes and more...at pressures up to 150 bars and over temperature ranges from ambient to 1000°C.

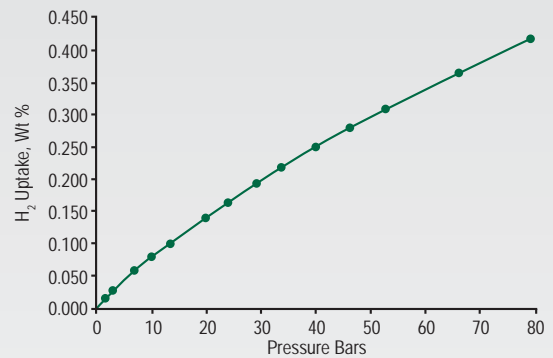
A high-pressure, three-gas flow dosing manifold is standard for introduction of dynamic atmospheres of reactive gas.

Using the continuous flow method, the TGA-HP Analyzers provide isotherms, isobars and time course data for the study of...

- General gas/solid reactions
- Oxidation/reduction of metals
- Degradation of ceramics
- Catalysts, zeolites, activated carbons and other specialty materials
- O₂ sequestration techniques

Applications

Adsorption of H₂ on Carbon Recent research has focused on the development of transportable reversible systems for hydrogen storage with a high capacity. These systems are critical to the large-scale application of hydrogen fuel cells, in particular for mobile applications such as automotive use. A higher-energy efficiency is attainable with systems in which hydrogen is concentrated by physical adsorption onto a matrix material above 70 K. The TGA-HP is the ideal tool for measuring the adsorbent efficiency for hydrogen sorption. The data in Figure 1 show the adsorption of H₂ gas onto an activated carbon matrix at 25°C (273 K). Note how the adsorption is quantified over the wide pressure range from sub-atmospheric to nearly 80 Bar (ca. 1150 PSI)



Adsorption of NH₃ on Zeolite Catalyst Zeolites are versatile materials with a wide range of potential uses. Their microporous structures provide the potential for precise and specific separation and storage of gas molecules from a complex gas stream. Catalyst technologies can then employ the adsorbed gases to facilitate redox chemistry on potentially toxic or noxious components of exhaust streams.

The data in Figure 2 shows the TGA-HP data of the adsorption of ammonia gas onto a zeolite matrix at two discrete temperatures, 30°C and 400°C, at pressures up to 7 Bar (ca. 100 psi). The TGA-HP is used to measure the quantitative capacity of the zeolite to adsorb the ammonia, thus allowing for the effective design of the exhaust stream catalyst technology.

