

**Specifications for automated instrument for the determination of**

- **PCI (pressure composition isotherms)**
- **Absorption desorption curves (PCI absorption, PCI desorption)**
- **Kinetics, Cycle Life, TPA, TPD and Surface Area Measurement.**

<b>Item</b>	<b>Sub-item</b>	<b>Values</b>	<b>Details</b>
Channels		2	Section 1
Pressure range		0.0054 bar to 200 bar	Section 2
Temperature/Heating	range	~80 to 750 K	Section 3
	controller	2 Independent	
	Furnaces, Dewar	1 each	
Chambers		One for each channel	Section 4
Vacuum system			Section 5
Computer			Section 6
Accessories			Section 7
Additional Details			Section 8

**1. Details of Channels**

	<b>Pressure Range</b>	<b>Temperature range</b>
<b>Channel 1; PCI-A, PCI-D, Cycle Life, Kinetics, Cryostat.</b>	0 to 200 bar	80 K to ~750 K

<b>Channel 2: TPA/TPD, PCI-A, PCI-D, Kinetics, Surface Science studies, High sensitivity, Cryogenic measurement</b>	0~68 bar	Room Temperature-750K
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Two channel Instrument with channel 1 & 2 with Detachable **Mass Spectrometer**.

Ability to perform experiments on samples using the two channels simultaneously and independently.

## 2. Pressure

As in details of channels (section 1)

## 3. Temperature and Heating

### Temperature Control: \* 2 units

Temperature controllers, Input: thermocouple, solid state relay, one for each channel.

Temperature controllers feedback and control using the central computer. Dual temperature displays: on controllers and on the computer monitors.

### Furnaces

Separate furnaces for the two channels. Separate heating tape (up to ~400°C) for sample activation. Cryostat-cum-furnace for working temperature 80-750 K.

## 4. Sample Chambers

Standard type:

~.754" dia. x 13" length (approx.), Sample capsule volume: 2 cc.

A chamber to perform work in liquid bath.

A chamber to perform surface area measurement and density.

Thermocouple tip positioned in the sample chamber almost touching the sample. Two sample chambers required. Calibration data/measurements files to be provided.

## 5. Vacuum system

Turbo-molecular pump backed by dry scroll vacuum pump (both branded high quality).

## **6. Computer**

Computer with two 27" monitors and requisite software to control the unit. Original software in CD. Manual for operations in CD + hard copy.

### **Software details:**

- Automated measurement of PCI curves; in absorption/desorption modes
- Automatic acquisition of reaction kinetic data at constant pressure
- Software controlled temperature programmed desorption
- BET Surface area analysis & gas pycnometry for porous materials
- Programming and control of process details (including channels)
- Data acquisition, storage and post-processing ability

## **7. PCI Accessories**

### **a.) Precision saw**

For cutting samples of suitable dimension for hydrogenation chamber.

### **b.) Ball Mill vials and balls**

For sample preparation in powder form for hydrogenation and dehydrogenation cycles.

### **c.) Metallurgical polisher**

For polishing the sample surface to reveal surface microstructure of prepared sample before and after hydrogen absorption and desorption.

### **d.) Piping and Fitting.**

High pressure piping and fitting.

### **e.) Glove Box**

Ability to control moisture and oxygen contamination for sample transfer in inert atmosphere.

### **f.) Hydrogen gas leak detector.**

## **8. Installation, Turn-key Operation, Warranty etc.**

### **Installation and training (onsite)**

Laboratory Installation of Instrument and proper demonstration of its operation. Full training on Instrument working and operation onsite and on the facility for two people. Standard Spare parts and some standard samples to test the instrument.

**Spares**

At least one set of important spares (seals, O-rings, etc.) which are required for routine use.

**Warranty**

3 (three) years onsite warranty on parts and labor after the instrument is installed.

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Kindly mention “**PCI**” on sealed envelope carrying quotation / in the subject column in the case of email reply with the printed literature. Send your best offer (technical & financial in separate envelop) so as to reach us on or before **July 25th, 2012** to the following address -

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Terms & Conditions:

1. Maximum educational discount, if any should be offered.
2. Prices should be on FOB IIT-Kanpur basis. No hidden/extra cost.
3. Prices should include the installation and training cost.
4. Warranty should at least be for three years after installation.
5. Validity of quotation should be at least for 60 days
6. Quotation should carry proper certifications like agency certificate, Proprietary Certificate, etc.
7. Any other charges from your side should be specified.