

## PCI INSTRUMENT FOR HYDROGENATION STUDIES

As we are aware, earth is fast running out of fossil fuels. Additionally, use of fossil fuels contributes to pollution and global warming. Solar energy is envisaged as an eco-friendly alternative to traditional fuels. The multi-organization project "Generation, Storage and Distribution of Solar Hydrogen" is being coordinated by IIT Kanpur and aims at tapping into solar energy for the production of hydrogen. This hydrogen can further be stored in a 'hydrogen battery'. The hydrogen battery can be used for onboard applications, where the by-product is only water and hence is *non-polluting and green*. The future of the technology is so promising that many have envisaged entire 'hydrogen economies'. A key component in the chain of technologies to be developed to realize this dream is suitable materials for hydrogen storage.

The Pressure-Composition-Isotherm (PCI) instrument for hydrogenation studies helps characterize materials regarding suitability for hydrogen storage applications. The PCI equipment can perform the following tasks:

- (i) generate pressure-composition curves at various temperatures and hence identify the plateau (two phase region) region of pressure,
- (ii) plot absorption desorption curves- reaction kinetics data (used to generate van't Hoff plots),
- (iii) density and surface area measurements.

The equipment will have two channels which can operate from 0.005-200 bars and can go from room temperature to 500°C. The vacuum system will have a turbomolecular pump backed by a rotary pump. The effluent gases can be characterized using a mass spectrometer (1-200 amu). The controller for the unit is interfaced with a PC with two monitors. The samples to be loaded into the equipment will be transferred using a glove box positioned next to the main equipment.

Although, the equipment will use hydrogen from cylinders, *it is built-in with safety features* like back flash arrester, high-pressure valves, moisture trap, *auto shutdown* feature, etc. Additionally, a hydrogen sensor with alarm will be installed at the site.



**Photograph of the PCI instrument**