



Name of the organization

National Center for Scientific Research "Demokritos"

Name of the infrastructure / laboratory

HYSORB

Address and country of the infrastructure / laboratory

Terma Patriarchou Gregoriou & Neapoleos, 15310 Ag. Paraskevi Attikis, Athens – Greece

Person responsible of the access / Contact person

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Main field of activity of the infrastructure / laboratory

► Hydrogen Storage

Short description of the infrastructure / laboratory

HYSORB is a highly specialized and well-equipped gas and vapour sorption laboratory. Its facilities congregate an extended collection of state-of-the-art, top-class and complementary instrumentation that allows accurate gas (e.g. N_2 , H_2 , CO_2 , CH_4) and vapour (e.g. H_2O) sorption measurements in well controlled sample environment at different pressure/temperature conditions (vacuum - 200 bar, 9 - 600 K) and scales (material quantities from mg to kg bed scale), for the study of physisorption and chemisorption phenomena in solid materials. The experimental possibilities can be significantly supported by simulation tools developed in-house, that provide an integrated approach exploiting the benefits between material and process design. Atomistic/Molecular level simulations (e.g. GCMC supported by DFT and/or abinitio methods) can be used for the characterisation of materials based on their gas sorption characteristics (N_2 , CO_2 , H_2) but also as a prediction tool for their gas sorption performance under different conditions.

Main research area(s) of the infrastructure / laboratory

Thorough characterization of textural properties (surface area, porosity, pore size and volume, density, surface acidity etc.) of porous materials, ceramics, powders, membranes, polymers etc.; determination of H_2 storage performance (sorption capacity, kinetics, thermodynamics, cycling) of solids including typical H_2 stores (carbons, MOFs, metal hydrides); water sorption and permeability measurements (that could also serve battery and fuel cell research).

Instruments and tools available for the above mentioned research

HYSORB laboratory offers a wide range of volumetric, gravimetric, calorimetric and spectroscopic techniques such as: an Intelligent Gravimetric Analyser (IGA, 77-600 K, vac-20 bar), a magnetically suspended Rubotherm balance (vac-200 bar, 77-1000 K), two commercial (PCT-Pro and VT1 HPVA 100) volumetric systems (0-200 bar, 77-600 K, one of them is also equipped with a micro-dosing module for accurate PCT measurements on very small sample quantities), two low pressure (<1 bar) high resolution volumetric apparatuses, a customised Thermal Desorption Spectroscopy coupled with MS rig (9-600 K), a Setaram C80 gas tight Calvet Calorimeter (1-350 bar, ambient-600K), a TGA/DSC/MS system (300-1500 K). Additionally, a set of gas and vapor permeability rigs are available, including a commercial automated unit (Dansensor PBI) specially designed for polymeric membranes.

