

## Physical adsorption volumetric set-up

### Description/Parameters

Commercial static adsorption set-up 3Flex (Micromeritics, USA) for determination of textural properties of solids by using physisorption of inert gases (nitrogen at 77 K, krypton at 77 K, argon at 87 K). The physisorption set-up is composed of two main parts: the degassing unit for drying of 6 samples (up to 350 °C) with their simultaneous degassing under vacuum (0.06 mbar) to remove physisorbed moisture and the adsorption measurement unit (working in  $p/p_0$  range  $\sim 10^{-7}$ -0.995), further accessories such as a vacuum pump, a turbomolecular pump, and a flask for liquid nitrogen/argon. The samples are measured on the set-up by a volumetric method.

### Utilization/Services

Determination of textural properties of solids (e.g. biochars, activated carbons, carbon aerogels and other carbon-based materials, molecular sieves, zeolites, clays, metal oxides etc.).

- **Determined textural parameters:** specific surface area  $S_{\text{BET}}$ , mesopores surface area  $S_{\text{meso}}$ , micropore volume  $V_{\text{micro}}$ , micropore-size distribution ( $d_{\text{pores}} = 0.4\text{-}2\text{ nm}$ ), mesopores-macropore-size distribution ( $d_{\text{pores}} = 2\text{-}200\text{ nm}$ ), net pore volume  $V_{\text{net}}$ .
- Porous solids (assuming  $S_{\text{BET}} > 2\text{ m}^2/\text{g}$ ) – nitrogen physisorption at 77 K, including micropores analysis from  $p/p_0 \sim 10^{-7}$  if reasonable.
- Nonporous solids (assuming  $S_{\text{BET}} < 2\text{ m}^2/\text{g}$ ) – krypton physisorption at 77 K (e.g. dental implants, drugs, raw biomass, sintered steel materials from metallurgy, ceramic materials etc.).
- For targeted physisorption studies - argon physisorption at 87 K.
- **Necessary pre-treatment of solids before physisorption analysis:** for removal of physisorbed moisture the degassing in vacuum of 0.06 mbar at minimum temperature of 105 °C is necessary, length of degassing - min. 8 hours, depending on the type of the solid.
- **Solids rejected to be analysed:** materials leaking residual organic vapours, materials with too much moisture, liquids, some polymers.

