Surface Measurement Systems
World Leader in Sorption Science

BTA Horizon

Self-contained multicomponent membrane permeation analyzer

The pioneering BTA Horizon is a self-contained membrane analyzer which measures competitive gas and vapor permeation through barrier films and porous membranes. This versatile instrument uses a cross-flow configuration to assess both single and multi-component permeation streams up to high temperatures. Delivering unparalleled flexibility for membrane characterization with its multiple dedicated sensors, the BTA Horizon is designed to assess permeation performance and kinetics in applications like moisture vapour and oxygen transmission rate, CO_2 separation selectivity from a humid stream, barrier properties of packages at different storage temperatures, and much more.

- Up to five mass flow controllers with tuneable gas calibrations
- Two heated reservoirs for water/solvents
- Temperature-controlled environment for samples, vapor, and gas sources
- Range of sample thicknesses (µm - mm)
- Generation of water and solvent vapors from 0-90 p/p^0 %
- Vapor/gas sensors located before & after the sample:
  - CO_2 at either % or PPM levels
  - Water vapor (humidity)
  - PID sensor - organic species: 1 ppb to 10,000 ppm
  - Thermal conductivity detector (TCD)
- Local heating of the membrane up to 150 °C
- Use of N_2 or He as cross-flow gases

Permeation through thin-films and membranes

- Easy to measure permeability for gases and vapor in single or multicomponent systems
- Kinetics of permeation and diffusion across membranes or packing films
- Assessment of temperature effects on permeation up to 150 °C, including *in-situ* heating / activation of the sample to observe glass-transition temperatures.

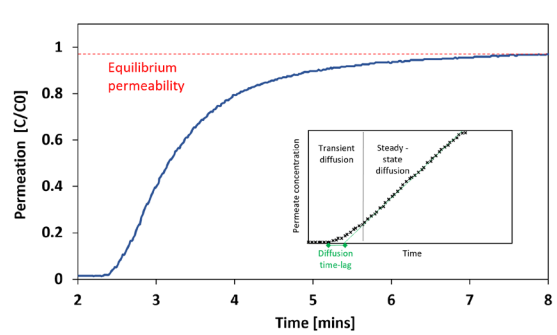

Figure 1: Permeation of 95 %RH through PET at 130°C, highlighting how the concentration front permeates through a membrane as a function of time

Comparing barrier films/protective layers

- Compare permeation through single and multi-layer films.
- Observe the effects of barrier surface modification on permeation.
- Accurately measure permeation through barrier films over a wide range of temperatures.

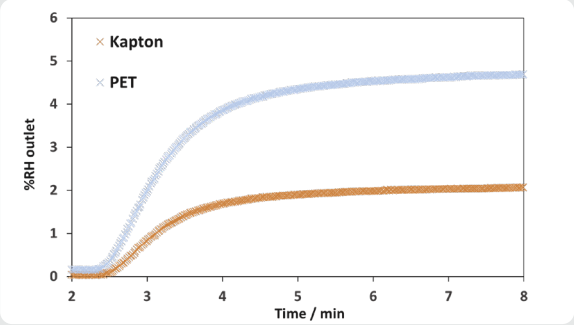

Figure 2: A comparison of the barrier properties of PET and Kapton against 95 %RH at 130 °C

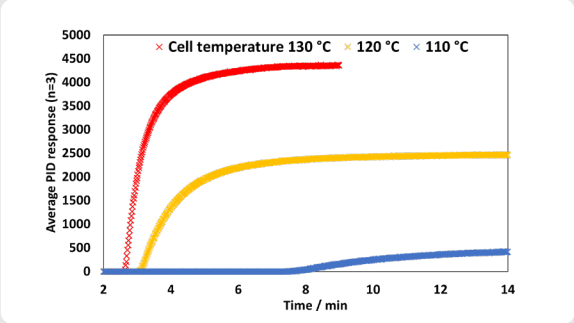

Figure 3: Increasing toluene permeation through PET from 110 - 130 °C

Case study: Impact of water vapor on CO_2 permeation through PIM-1

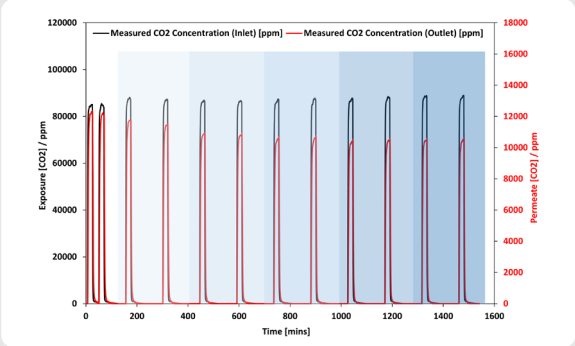

Figure 4: Permeation of 9% CO_2 through PIM-1 at 25 °C, with increasing %RH

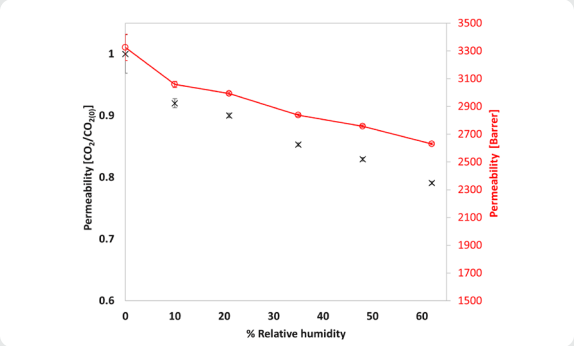

Figure 5: The influence of humidity on CO_2 permeation [Barrer] through PIM-1

- Explore the influence of humidity on the permeation of gases and vapors through membranes.
- A characteristic decrease in the CO_2 permeation through PIM-1 was observed, caused by channel blockages, with a 20% decrease in CO_2 permeation through PIM-1 upon exposure to 50 %RH.
- Compare how membrane gas selectivity responds to temperature, humidity, & partial pressure changes.
- Near-perfect repeatability over three experiments, resulting in small errors.

Capabilities

- Enclosure temperature: 10 - 60 °C ±0.2 °C
- Sample heating up to 150 °C
- 50 mL heated water/solvent reservoir
- Built-in sample holder bypass
- Varying sample holder dimensions to accommodate diverse membranes/films
- Dedicated inline sensors for measurements of water, CO_2, organics (multiple range PID), & gases such as N_2 and He (TCD)
- Optional functionality with a mass spectrometer

Generation of gases & vapors:

- Mixing with resolution of 0.1 mL/min MFC
- Water/solvents 0-90 p/p^0 % at ambient conditions
- ppm-level of organic solvents / VOCs*
- Dead volume calculations with helium pulses

System information:

- Width: 520mm, Depth: 610mm, Height: 980mm
- Instrument Weight: 80kg

To inquire about the BTA Horizon, email us at: sales@surfacemeasurementsystems.com