Vapour Permeability of Membrane Films using DVS Payne Diffusion Cell

Majid Naderi[1], Manaswini Acharya[1], Jurgen Dienstmaier[1], Anett Kondor[1], Armando Garcia[2] and Dan Burnett[2]

[1]*Surface Measurement Systems Ltd.,* Unit 5, Wharfside, Rosemont Road, Alperton, London. HA0 4PE, U.K.

[2]*Surface Measurement Systems Ltd., 2125 28th Street SW, Suite 1, Allentown, PA 18103, U.S.A.*

MNADERI@SURFACEMEASUREMENTSYSTEMS.COM

Moisture transport characteristics of porous materials play an important role in many industries. For example; packaging materials which can be directly related to shelf life and packaged product stability; model membranes which are widely used in in-vitro permeation studies in skin care industry; and electrospun nanofibres for polymeric scaffolds.

Moisture vapour transmission rate (MVTR) measurements are generally carried out under isothermal conditions. MVTR describes the rate of water permeating through a test specimen into the headspace volume of a container which differs in relative humidity (∆RH).

Permeability, *P* hence can be represented as:

$$P = \frac{MVTR}{\Delta RH} \qquad (1)$$

where MVTR can be expressed in terms of the mass of moisture transferred, Δm in a unit time, Δt:

$$MVTR = \frac{\Delta m}{\Delta t} \qquad (2)$$

Dynamic gravimetric vapour sorption (DVS) is a well-established method for the determination of vapour sorption isotherms. The high mass resolution and excellent baseline stability of DVS allows the fast and accurate determination of water sorption isotherms and diffusion kinetics over a wide range of temperature and humidity. DVS instrument therefore can be used to determine the MVTR of porous materials.

In this study, the moisture vapour transmission characteristics of porous materials were investigated using a specially designed Payne diffusion cell and DVS instrument.