

# Oxygen permeability

## Oxygen permeability

### 1.1. Principle

A nail polish sample is put inside a diffusion chamber. Pure oxygen (O<sub>2</sub> 99.9%) flows in the upper half of the chamber while oxygen free carrier gas (nitrogen N<sub>2</sub>) flows in the lower half of the chamber, on the other side of the film.

Oxygen molecules diffuse through the film, and increase oxygen concentration in carrier gas. Oxygen concentration in carrier gas is directly measured through a sensor without complex extrapolation.

OTR, Oxygen Transmission Rate is defined by the volume of gas diffusing through film surface within 24 hours [unit: cm<sup>3</sup>/(m<sup>2</sup>.24h.bar)]

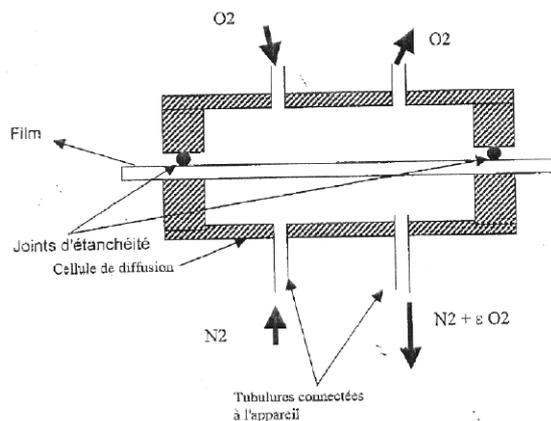


Figure 1 :

Oxygen permeability measurement

### 1.2. Results

Référence	O <sub>2</sub> Permeability [unit: cm <sup>3</sup> /(m <sup>2</sup> .24h.bar)].μm
Standard Nail Polish	27 998
F9395	38 663

→ Oxygen permeability is 38% higher with base F9395 compared to usual base. Result characterizes a permeable film (see table below).

Typical value:

Category		O <sub>2</sub> Permeability [unit: cm <sup>3</sup> /(m <sup>2</sup> .24h.bar)].μm
very permeable	PEBD	100 000 – 200 000
	PEHD	37 500 – 75 000
	PP	25 000 – 100 000
Permeable	PET	10 000
	PA	2 500
Impermeable	PVDC	10 – 100
very impermeable	EVOH plated	1 - 10

Experimental conditions

The measurement of oxygen transmission rate is carried out according to ASTM F2622 (2008-07).

Pre-conditioning            24 h at 23°C and 50 % of relative humidity

Temperature                23°C ± 1.0°C

Humidity                    50 % ± 5 % of relative humidity

Concentration test gas    100%

Test area                    50 cm<sup>2</sup>

Stabilization duration after introduction of the oxygen: 20 hours