

CO₂ sorption measurement of materials used in food packaging

Introduction: The development of advanced packaging materials for the food industry relies on precise and efficient materials characterization capabilities.

For the food industry a precise knowledge of CO₂ sorption properties by the packaging is particularly important for product quality for the development of plastics and coatings for bottles, and for fundamental understanding of absorption and diffusion properties.

In this application the interest was the precise determination of CO₂ gas sorption properties of the well known packaging material, polyethylene terephthalate (PET). The PCTPro-E&E was used to measure a series of sorption isotherm on amorphous and crystalline PET.

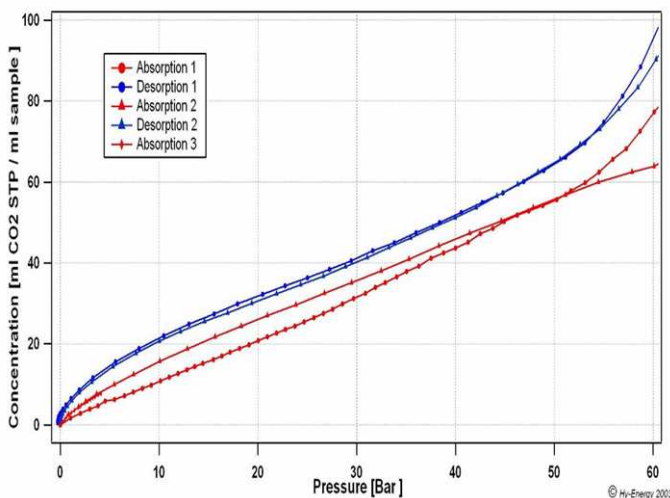


Fig 1: PCT measurements of crystalline PET

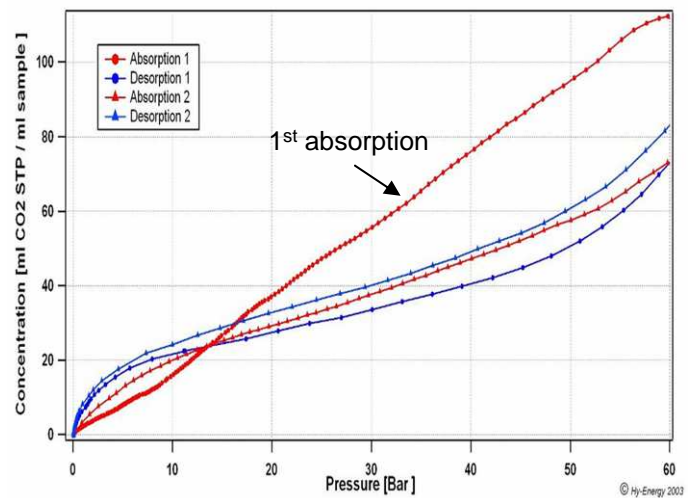


Fig 2: PCT measurements of amorphous PET

Experimental :

About 2 grams of PET (cut in wide strips) was inserted into the standard sample holder. After dead volume calibration, CO₂ was introduced in pressure steps (from 0.001 to 68 bar) and the absorption was measured isothermally at 29.5°C. CO₂ is desorbed subsequently in pressure steps to obtain the desorption curve.

Results:

The curves provide the CO₂ concentration in PET according to the pressure.

For crystalline PET (fig 1) the PCT isotherms demonstrated only a slight modification with the cycles. On the contrary the properties of amorphous PET (fig 2) are strongly modified during the first absorption. The kinetics of CO₂ sorption can also be determined from the time resolved data of the same measurements (not shown on the graphs).

Conclusion:

The measurements demonstrate that CO₂ uptake in PET can easily be measured using the automated measurement capabilities of the PCTPro-E&E. This type of investigation can apply to any food packaging materials.

Instrument :

PCTPro-E&E
-260°C / 500°C



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