

Evaluating active pore size in permeation through cork

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The permeability of gases through cork was investigated. A mass spectrometer leak detector was used to measure the helium flow through the central area of small discs having 10 mm in diameter and 2 mm thick. The permeability for nitrogen and for oxygen was measured by the pressure rise technique.

Cork is a dead cellular material, whose cells are therefore hollowed of cytoplasm, being only constituted by the cell wall and gas inside. The cell walls are majoritly composed of suberin, lignin and cellulose, being the suberin and the lignin the structural materials. Cork is usually referred as impermeable, being this characteristic attributed to the suberin, a highly hidrophobic waxy material. Although the inner volume of the cells is basically closed, very small channels - the caniculli, between cells were found by electron microscopy.

The transport mechanism of gases through cork was examined. The main goal was to understand if gas flow was through the cell walls or via open channels, the caniculli. Results suggest that gases permeate cork by those channels between cells under a molecular flow regime. The diameter of such channels was calculated, having a mean diameter in the range of 30 to 60 nm well in agreement with the caniculli size in the cork cell walls measured by electron microscopy.

Keywords Permeation, gas flow, cork.