

Permeation through Polymer Latex Films

by

J. Hearn , P. Steward and M.C. Wilkinson

Films have been cast both from latices prepared by soap-free emulsion polymerisation and from commercially available latices. Film formation has been studied in relation to film morphology and its influence on the transport properties. Gas, water vapour and solute transmission rates have been measured for free films prepared with and without additives likely to influence transport. The ability to exert such control could be exploited in eg. sustained drug release.

Probe molecules employed in this study have included nitrophenol, a series of substituted anilines, potassium chloride, labelled sucrose and labelled water. Electron microscopy and mercury porosimetry help to identify porosity created upon leaching. Hydrophilic and water soluble additives can, up to a limit, increase the permeation of solutes having partition coefficients favouring the polymer whilst simultaneously reducing the gas permeability of the unleached films. Up to this limit films remain impermeable to potassium chloride but beyond the limit water filled capillaries or hydrated networks giving direct connections between the sides of the film are implicated in enabling ion transport. Porosity which exists in leached films whilst kept wet is lost upon drying unless the polymer has a high T_g . Solute transport by activated diffusion and by diffusion through water filled channels need not be mutually exclusive but the latter mechanism can be made to predominate and yield similar fluxes for solutes of varying film solubility.