DIFFUSION OF VOLATILE HYDROPHILIC SUBSTANCES THROUGH GLYCEROGELATIN FILMS

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The encapsulation of volatile hydrophilic materials in soft gelatin capsules is potentially problematic since the material can diffuse through the shell during manufacture and storage.

Diffusion has been studied using columns of glycerogelatin mixtures (Armstrong et al., 1986), but this technique is only suitable for gels with a relatively high water content (ca. 40%) such as occur during capsule filling. During drying, the water content falls to about 8% over a period of 3 days. Diffusion in this more rigid gel cannot be studied by the column technique and so a method using films had to be devised.

Ethanol was chosen as the model diffusant. It was placed in the donor compartment of a diffusion cell (Fig.1). In the receiver compartment, separated from the donor compartment by the glycerogelatin film, was a stirred stream of air of known flow rate. It was ascertained that the support mesh and stirring condition did not give rise to stagnant layers under the film. Ethanol diffused through the film into the air stream which was analysed using a fuel cell detector (Lion AE-D3 Alcolmeter). Repeated sampling at 10 minute intervals for periods up to 24 hours was achieved by the use of solenoids actuated by a BBC model B microcomputer.

The apparatus has been used to investigate the influence of gel water content on diffusion. Following the work of Melia et al. (1985), films of differing moisture contents were prepared by exposing them to saturated electrolyte solutions of known relative humidity, and the air stream passed over the same solution. Results are shown in Fig. 2 which shows that the water content of the film has a major influence on the diffusion coefficent of ethanol in glycerogelatin films.

FIGURE 1 : DIFFUSION CELL

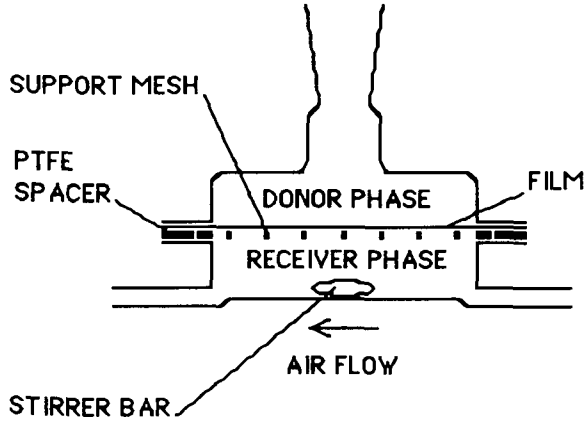
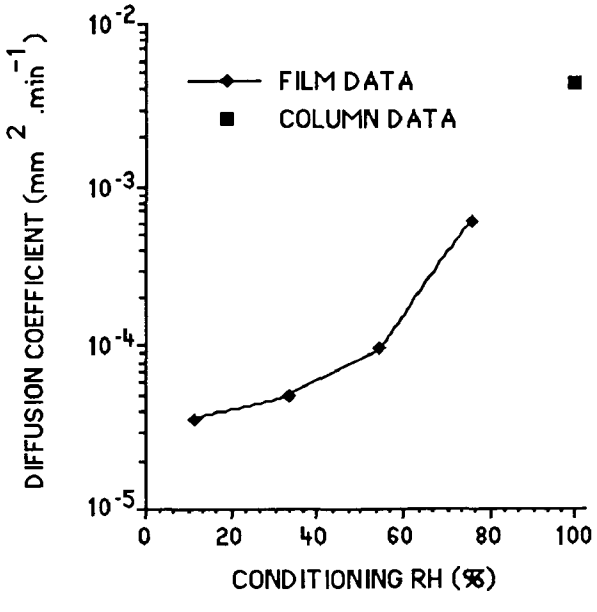


FIGURE 2: THE EFFECT OF CONDITIONING RELATIVE HUMIDITY ON ETHANOL DIFFUSION



Armstrong, N.A. et al., (1986) Int. J. Pharm. 34, 125 - 129
Melia, C.D. et al., (1985) Int. J. Pharm. Tech. & Prod. Mfr. 6, (4) 13 - 17