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SOME ASPECTS OF TWO STAGE DIFFUSION IN POLYMER FILMS AND MEMBRANES

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Abstract

The two-stage sorption data for dichloromethane vapour in a cellulose triacetate films and membranes are analysed by the variable-surface concentration model and the diffusion relaxation model. Satisfactory fitting of the data and similar kinetic parameters are obtained using these models. The diffusion coefficient for dichloromethane is about 2.5×10^{-11} m^2 s^{-1} in the glassy polymer at 40°C and is near $1.5 – 2.5$ times higher as the polymer goes over the glass-rubber transition region due to solvent sorption. The relaxation rate constant is between 3.0 and 18×10^{-4} s^{-1} and is increased as the sorbed concentration or the vapour activity of solvent increases. When the two-stage non-Fick sorption prevails, the diffusion-relaxation model approximates the limiting cases of the both models.

Key words: cellulose triacetate membranes, non-Fickian diffusion, two stage sorption

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