Thesis Title	A Study of Diffusion and Mathematical Model of Diffusion in Porous Materials
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Abstract

Diffusion in porous materials, especially in foods, is complicate and difficult to study and understand. Many food processes involving in diffusion are still based on empirical design, because diffusion theory in foods is not well advances and diffusion properties are not readily available. Therefore, the objective of this research is to review the literatures concerning diffusion in porous materials, to study theory and mathematical model of diffusion in porous materials and to suggest an appropriate diffusion in porous materials.

Firstly, the diffusion theory are well established by the obstruction effects and increment of hydrodynamic drag. The obstruction effects compose of the tortuosity, the stochastic approach, the Ogston 's equation and the structural models. Secondly, the mathematical model of diffusion in gel had been found in the form of the ratio of the effective diffusion coefficient to the diffusion coefficient of pure solvent (D_{eff}/D_o) which depend on polymer volume fraction and solute size.

In drying processes , we found that the diffusion of moisture was provided in two concepts . First, most research study that the diffusion coefficient were functions of moisture content and temperature, the mathematical model which prediction the diffusion coefficient was still empirical model. The other concept had based on the effects of distribution and structure of pores in materials, the mathematical model which prediction the diffusion coefficient was structural model.

And finally, the diffusion in gel had been compared between theoretical values with experimental data. The results showed that the obstruction effects such as the structural models were not well fitted, while the stochastic approach was an appropriate acceptable for small solute molecules and the Ogston ' s equation was an appropriate for large solute molecules. Hydrodynamic drag model also gave the better results for moderate solute molecules. Moisture diffusion in foods, the major parameter was porosity of materials and the structural models only were successful for prediction moisture diffusion coefficient in drying of starches.

Keywords : Diffusion / Porous Materials / Diffusion Coefficient / Foods / Gels