Ratchaneewan Kulchan 2008: Determination of Activation Energy for Water Vapor Permeability of Plastic Films and Applications in Moisture Sensitive Food Packaging. Master of Science (Packaging Technology), Major Field: Packaging Technology, Department of Packaging Technology. Thesis Advisor: Assistant Professor Panuwat Suppakul, Ph.D. 130 pages.

The purposes of this research were to survey the preliminary data of plastic films for moisture sensitive food packaging, to determine activation energy for water vapor permeability of the films and to study the efficiency of the use of activation energy (E_a) in order to predict the shelf life of moisture sensitive food. Form the survey; it was found that laminated film was used as a major packaging material in moisture sensitive food industry. Activation energies for water vapor permeability of selected 25 packaging films were determined. They can be classified into 3 groups: a) film with low E_a (4.05-7.47 kJ mol^{-1}), b) film with medium E_a (11.20-15.40 kJ mol^{-1}) and c) film with high E_a (18.13-24.63 kJ mol^{-1}). In order to study the efficiency in shelf life prediction of Khanom Phing by using E_a as a correction factor, moisture sorption characteristics was firstly required to investigate. For moisture sorption kinetic, it was more rapid in the initial stages and a lesser amount of moisture was adsorbed as adsorption time increased. The higher the relative humidity used, the more pronounced effect. Its moisture sorption isotherm curve can be classified as type II sigmoidal isotherm. The equilibrium moisture content of Khanom Phing dramatically soared above $A_w = 0.73$. GAB, Peleg and Lewicki models were found to be the better-fitted model for Khanom Phing. It was also investigated effect of relative humidity on Khanom Phing's quality (i.e. proximate analysis, physicochemical properties (initial and critical moisture contents), physical property (hardness), thermal property (glass transition temperature) and sensorial property (texture)). It was initially in a glassy stage with A_w, moisture content and glass transition temperature (T_g) of 0.38, 3.9% and 148 ^{o}C, respectively. A sensory test indicated that the product was highly crispy (score = 7.8). As having A_w lower than 0.54 (6% MC), the product crispness was preserved in satisfactory degrees (score $\geq$ 5). Interestingly, it was noticed that once the product hardness or work reached the maximum and began to reduce at $A_w \approx 0.54$ (6% MC, the product texture became detected as slightly soft (score = 5, unacceptable texture). Consequently, 6% MC ($A_w \approx 0.54$) of Khanom Phing was defined as critical moisture content. Estimated by employing activation energy, the shelf lives of Khanom Phing packed in LDPE(E_a = 21.32 kJ mol^{-1}) and OPP (E_a = 21.39 kJ mol^{-1}) pouches were found to be 37 and 122 days, respectively. These predicted shelf lives were closed to the experimental shelf lives of Khanom Phing (35 and 119 days, respectively), stored at 30°C and 50% relative humidity. Therefore, this study demonstrated the efficiency of the use of E_a for shelf life prediction.

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