CHAPTER I
INTRODUCTION

The quality, freshness and safety of food are required by consumers due to changes in the way of food production, distribution, storage and retail. Therefore, food safety assurance has been critically important to consumer confidence. Various approaches have been used for the determination of food quality. Currently, most packaged food only offers an expiry date which depends on the suitable temperature of storage at every step of the distribution process. For highly perishable foods such as fish, meat, milk, there is a definite risk that the product may be spoiled when sold to the customer despite being well within its expiry date. Public health concerns and the reputation of supplier are consequently impacted.

To meet the growing demands of consumer freshness and safety in food products, intelligent packaging system has become an alternative method to determine food quality and to warn distributors, suppliers and consumers about the state of the product. It has been defined as packaging system which monitors the condition of packaged foods to give information about the quality of the packaged food during transportation and storage.

Meat quality can be determined by intelligent packaging. By this technique, many chemical methods have been used as indices of deterioration of meat quality. They usually measure the amounts of breakdown products derived from enzymatic, bacterial or oxidative activities. Total volatile basic nitrogen (TVB-N) is one of those products formed by the bacterial degradation; therefore, it has been implicated as indicator of meat products.

Polypropylene (PP)/organoclay nanocomposites coated with poly(3,4-ethylenedioxythiophene):Poly(sodium-4-styrenesulfonate) (PEDOT:PSS) or copper (II) ion (Cu^{2+}) can be used as intelligent packaging for meat spoilage based on the detection of TVB-N produced during aging of meat. PEDOT:PSS exhibits a high degree of visible light transparency in the oxidized state, while being an opaque blue in the reduced state. It gives color of opaque blue when it exposed to decomposed components of the aged meat e.g. TVB-N. Additionally, Cu^{2+} turn color from light blue

to green then to brown after exposure to decomposed components corresponds to the change of oxidation number from +2, to +1, and then 0, respectively.

In this research work, packaging film based on PP organomodified clay nanocomposite film fabricated with PEDOT:PSS and $Cu(NO_3)_2$ by varying concentration of sensor, sensor thickness, %clay content in nanocomposite film, the amount of meat samples, and type of sensor will be prepared. The capability to use this film as intelligent packaging is demonstrated in term of change in total color difference (TCD).

OBJECTIVES

1. To prepare an intelligent packaging from PP/organoclay nanocomposite film fabricated with PEDOT:PSS and Cu^{2+} sensors
2. To evaluate an intelligent packaging by studying the effect of concentration of sensor, sensor thickness, clay content in nanocomposite film, the amount of meat samples, and type of sensor on color change of PEDOT:PSS and Cu^{2+} sensors

SCOPE OF RESEARCH WORK

The scope of this research work will cover:

1. Preparation of organoclay by using ion exchange reaction between Na^+ and cationic surfactant, dipalmitoylethy hydroxyethylmonium methosulfate under trade name Stepantex™ SP-90
2. Preparation of PP/organoclay nanocomposite pellets by melt blending in a twin screw extruder using Surlyn® as a reactive compatibilizer
3. Preparation of PP/organoclay nanocomposite films by using blow film extrusion machine
4. Synthesis of PEDOT:PSS sensor by using chemical method
5. Fabrication of intelligent films by spin-coating sensor, PEDOT:PSS and Cu^{2+}, onto nanocomposite films
6. Evaluation of efficiency of intelligent films by studying the following parameters on the color change of PEDOT:PSS and Cu^{2+}
    1) Effect of concentration of sensor
        - 1, 3, and 5 %w/w for PEDOT:PSS sensor
        - 1, 3, 5, and 10 %w/w for Cu^{2+}sensor
    2) Effect of sensor thickness by controlling spin-coating speed
        - 1000, 2000, and 3000 rpm
    3) Effect of clay contents in nanocomposite film
        - 1, 3, 5 %clay
    4) Effect of the amount of meat tissues
        - 25, 50,100, and 150 g
    5) Effect of type of sensor
        - PEDOT:PSS sensor
        - Cu^{2+} sensor