



CHAPTER I

INTRODUCTION

1.1 The Purpose of the Investigation

Rubbers are usually electrically insulating and industrial insulation used today. Although conductive rubber has been known since the later part of the nineteenth century, it was not of major interest until about 1930, Rubbers can be rendered conductive by the incorporation of adequate loading of carbon black, certain types produce considerable conduction at loading as low as 20 parts per 100 parts (by weight) of the raw rubber. The particles of carbon black range in diameter from 10 to 300 millimicrons and are formed by burning or cracking hydrocarbon oils or gases. These particles tend to form themselves into chains, instead of being randomly dispersed, and the carbon chains give rise to the conductivity of the rubbers. The values of resistivity which may be attained lie between 1 ohm.cm and 10^{15} ohm.cm [1].

Conductive rubbers may be used instead of metallic conductors because the soft materials have the obvious advantage of flexibility and ability to absorb mechanical shock. Both soft and rigid materials have the following advantages over metals :

- (i) Ease of shaping
- (ii) Low density
- (iii) Wide range of electrical conductivity
- (iv) Low thermal conductivity
- (v) Corrosion resistance

Currently, much work is devoted to the synthesis of conducting polymer for use in a variety of applications. They has been successfully demonstrated to be useful such as in liquid junction photoelectrochemical solar-cells etc.. And conducting polymers shows higher electrical conductivity than carbon black [2]. Therefore conducting polymers such as polypyrrole are used instead of carbon black in the production of conductive natural rubber.

In this study, the introduction of polypyrrole copolymers onto natural rubber has been investigated. Natural rubber abundantly available in Thailand, can be prepared as a backbone polymer. Natural rubber particles were coagulated by electrochemical method on anode [3]. The natural rubber film produced on the anode is sticky and has good mechanical stability. This same method can be used to synthesized polypyrrole film [4] that shows high electrical conductivity. Polypyrrole can be combined onto natural rubber to produce conductive film. As a result, the procedure can be applied to produce a new material that combined the advantage of both properties of natural rubber and polypyrrole together.

1.2 Objectives of This Studies

1) To prepare a conductive natural rubber using polypyrrole by electrochemical method in which suitable conditions for preparation is investigated, i.e., thickness of natural rubber film, concentration of LiClO_4 , reaction temperature and reaction time.

2) As a comparison, the electrical conductivity of natural rubber that blended with synthesized polypyrrole from chemical polymerization is also investigated.

3) To observe the stability of the conductivity of prepared conductive natural rubber when placed in various environments , such as in acid-base solution, dry air (in desiccator), and open air

4) To characterize the properties of the conductive natural rubber.

1.3 Scope of the investigation

The work involved in the preparation of conductive natural rubber, in order that high conductive natural rubber may be obtained, has been planned as follows :

- 1) literature survey and in-depth study of the preparation method,
- 2) designing devices for this investigation,
- 3) preparation of the natural rubber film by electrochemical method in order to produce the backbone polymer,

4) preparation of the conductive natural rubber using polypyrrole by electrochemical method at various conditions of : concentration of LiClO_4 , electrical potential (voltage) that supplied to reaction cell, reaction time and reaction temperature and various atmosphere.

5) testing of the physical properties of prepared conductive natural rubber by Vander Paw method,

6) synthesis of polypyrrole by chemical polymerization, and subsequently mixing physically with coagulated natural rubber. So that its electrical conductivity can be compared with conductive natural rubber prepared by electrochemical method.



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