



## CHAPTER I

### INTRODUCTION

Polymer foam (1) is defined as a polymer the apparent density of which is decreased substantially by the presence of numerous cell disposed throughout its mass. The gas phase in a polymer foam is usually distributed in voids or pockets called cells. If these cells are interconnected, the polymer is termed open-celled. If the cell are discrete and the gas phase of each is independent of that of the other cells, the material is termed closed-cell. The nomenclature of polymer foam is not standardized, classifications have been made according to the properties of the base polymer, the methods of manufacture, the foam structure, or some combination of these.

A sponge rubber introduced between 1910 and 1920 is generally considered as the first one commercial polymer foam and polymer foam and polymer foams have been commercially accepted for a wide variety of application since the 1940s.

Nowadays, there are many manufacturing techniques for polymer foam processing. One of the most important process is cross-linking/foaming process. This process

was done by using a chemical blowing agent which releases free gases at the beginning or during the cross-linking step. In order to obtain a large volume increase, the compounding polymer must have a good flow property. This is achieved by a good uniform mixing depending on the formulation and processing condition. It is also important that blowing temperature and scorch temperature are well adjusted to each other. It has to be considered that cross-linking must not start too late, otherwise the already blown compound can collapse again. The formulation of polymer foam is normally desired on the nature of polymer and the end-use properties. The formulation also can be compounded or mixed by methods which are generally applied in polymer industry. The processing conditions are dependent strongly on the formulation and foaming process.

In the recent years, there have been a marked increase in using of ethylene-vinylacetate copolymer (EVA) which is well known as a raw material to produce a polymer foam especially for shoe soles. The properties of EVA copolymers (2) are modified by compounding with other ingredients and both cross-linking and foaming processes. Modified EVA foam shows many differences in properties such as, tensile strength, tear strength, permanent set, flexibility, resilience, cracking resistance, cushioning properties, elasticity and weight save.

One of the interesting modification technique to control the uniformity of cell foam is blending of polyisoprene rubber in the cross-link foaming process of EVA copolymer. This modification improves cushioning properties, higher flexibility and better resilience property. This technique is widely used in shoe sole manufacturing processes.

Due to rapid growth in shoe industries in Thailand during the past decade, the use of EVA modified copolymer is considered as one of the major area for shoe industry development. Our aim in this investigation is also set to support in this point.

In this work, the replacement of the synthetic rubber : polyisoprene, by natural rubber in foaming process of EVA copolymer is investigated. The suitable conditions in two step process: compounding and cross-linking foaming, to control and balance the decomposition rate of blowing agent and the cross-linking rate are also observed.

Results of this investigation are expected to let one who involves in shoe and polymer industries get more understanding and know how for a further adaptation in this field.