

# CHAPTER I



## INTRODUCTION

Rubber compounding is essentially the science (and art) of selecting and combining ingredients to produce a useful polymer which will have characteristics sufficient to perform satisfactorily under conditions in which the end product is intended to be used. From the manufacturer's perspective, the major factors influencing compounding decisions are price, processing, and properties [1].

There are many ingredients in any rubber compound; each ingredient has its specific function and impact on properties, processibility, and price. In order to reduce the cost of investment of the compound that is suitable for certain applications, knowledge on the function and effectiveness of compounding ingredients is indispensable.

Vulcanizing agent is one of the important additive ingredients in compounds, which must be present to cause chemical reaction in its molecular structure, converted from a thermoplastic to a thermoset having improved elastic properties. Sulfur is the most popular vulcanizing agent because of its predominant properties. However one of the disadvantages is reversion of sulfur. The reversion increases with an increase in the amount of sulfur. Furthermore, it is easy to bloom because sulfur has low solubility in rubber at room temperature. A sulfur donor is used to replace sulfur in order to solve this problem.

Cashew (*Anacardium occidentale*) is a member of the *Anacardiaceae* family. It is indigenous to South America and was introduced as a soil binding tree to the west coast of India by Portuguese in the 16<sup>th</sup> century. The Portuguese and Spanish spread the cashew throughout the tropics America and India, but the cashew did not become important in international trade until the early 19<sup>th</sup> century. The cashew nut shell liquid (CNSL) is a by-product of cashew industry. It consists chiefly of two naturally occurring unsaturated phenolic compounds, 90% anacardic acid and 10% cardol with

minor amounts of 2-methyl cardol. Anacardic acid, a derivative of salicylic acid, is converted to decarboxylated CNSL by a heating process giving cardanol which is a monohydric phenol with a long unsaturated hydrocarbon side chain at *meta*- position. The *ortho*- and *para*- that have suitable positions are available to react with sulfur, which could be used as the sulfur donor for vulcanizing rubbers.

The objectives of this research are to synthesize the vulcanizing agent from cardanol, and to study mechanical properties of rubber which is prepared from vulcanizing agent.

This investigation is concerned with the preparation of cardanol polysulfide (CPS) from cardanol. The reaction will be carried out under different conditions such as reaction temperature and reaction time. CPS is used as vulcanizing agent by mixing it with natural rubber and other additives. Finally, the vulcanization characteristics, mechanical properties, accelerated aging will also determined.



ศูนย์วิจัยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย