CHAPTER I

INTRODUCTION

1.1 Introduction

Hevea rubber contains rubber and non-rubber. Although some non-rubber can be advantageous to the finished rubber, but proteins is not significantly advantageous. On the other hand, proteins can adversely affect the dynamic properties due to the polar and hydrophilic characteristics. The removal of proteins from latex has been well-known as deproteinized natural rubber (DPNR) or low nitrogen natural rubber (LNNR). The viscosity of raw rubber increases during processing, shipping, and storage. The high viscosity rubber may require long pre-mastication time, peptizing agent and more energy consuming. The increase in viscosity can be minimized and viscosity stabilized (CV) by the addition of 0.15 p.h.r. hydroxylamine hydrochloride. CV-DPNR is prepared by simultaneous addition of hydroxylamine hydrochloride and proteolytic enzyme to the latex. From previous work, the successful method for the removal of proteins from latex were chemical hydrolysis (John, 1971 ; Pillai, 1972 ; John and Sin, 1973 ; Yapa, 1977) and enzymatic hydrolysis (Chin and Smith, 1974 ; Smith, 1974 ; Chang et al., 1977 ; Yapa, 1975 and 1984). The enzyme method is suitable for DPNR production because it has no adversely affect on the oxidative resistance. But the production of DPNR requires long time (about 24 hours) and can remove only about 40-70 % of the original nitrogen (Nadarajah et al., 1973 ; Yapa and

Balasingham, 1974 ; Chang, Lau and Nambiar, 1977 ; Visessanguan, 1992). In this study, an agitated tank is used for CV-DPNR production because it can reduce reaction time and the removal of proteins is highest. This is because an agitation provide good mixing between enzyme and latex, good circulation of reaction mixture in the tank and good heat transfer into the latex. The purity of lower nitrogen rubber is improved resulting in less water absorption. Hence its improve physical properties, making it is suitable for engineering and medical applications.

1.2 Raw rubber production

The utilization of natural rubber has been increased at present -day due to some properties such as good elasticity and insulation. Although synthetic rubbers are avaiable, but due to higher price and lower elasticity than natural rubber, the consumption of natural rubber has gradually increased. In 1992, the consumption of natural rubber has risen by 3.1 % (Seifert, 1993) Natural rubber, therefore, remains a useful raw material for manufacturing rubber products.

In Thailand, the major areas for natural rubber (Para rubber) plantation are in Southern and Eastern parts. It is now expanded to the Northeast. Natural rubber is one of the major sources of income. Malaysia and Indonesia were previously the first and second largest rubber producers in the world. But recently Thailand has become the world's leader in natural rubber production. The country produces at present 1,431,000 tons of natural rubber annually. Only 110,000 tons are comsumed domestically and the rest are exported to various countries as shown in Table 1.1 and Figure 1.1.

Table 1.1 The major rubber producers in the world, 1981-1992

Unit : tons

Year	Malaysia	Indonesia	Thailand
1981	1,455,400	808,700	502,001
1982	1,354,400	801,400	562,210
1983	1,537,900	938,000	587,975
1984	1,529,000	1,009,600	629,189
1985	1,465,800	1,000,900	721,871
1986	1,485,200	958,700	782,120
1987	1,578,500	1,092,800	921,558
1988	1,563,600	1,132,000	974,879
1989	1,364,800	1,151,800	1,178,388
1990	1,292,000	1,262,000	1,275,104
1991	1,253,000	1,284,000	1,340,596
1992	1,230,000	1,327,000	1,431,000

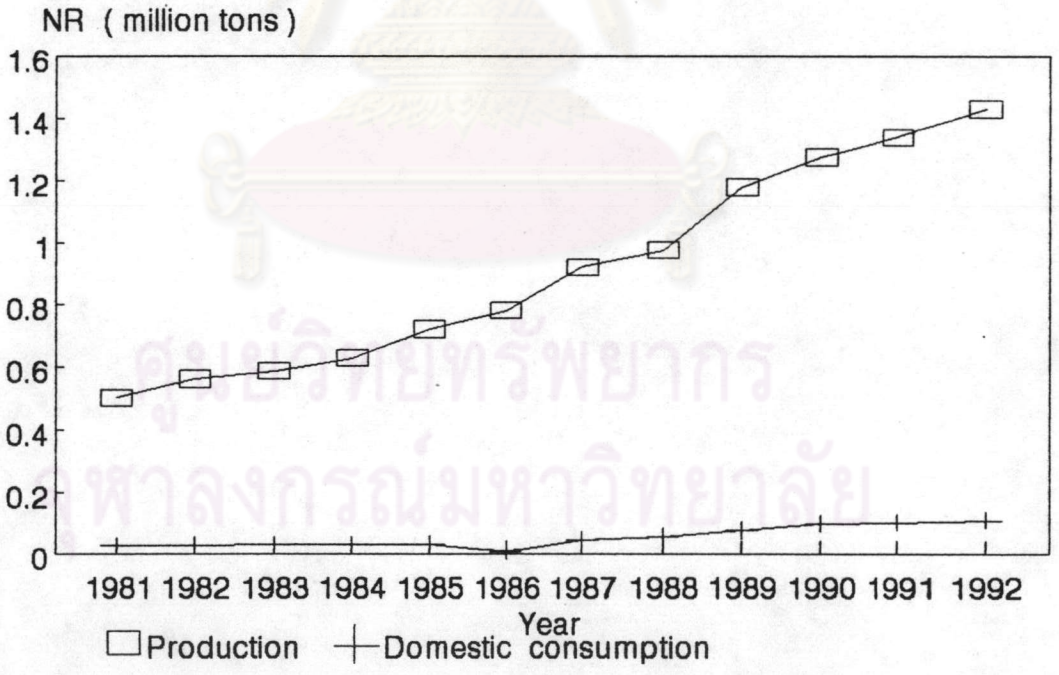

Figure 1.1 Production and exports of rubber in Thailand, 1981-1992

Source : Rubber Research Institute of Thailand

Natural rubber as a raw material can be classified into 2 major groups, dry rubber and concentrated latex (วราภรณ์ ขจรไชยกุล, 2532). Dry rubber from fresh latex is classified into 5 groups, ribbed smoked sheet (RSS), air dried sheet (ADS), crepe rubber, block rubber or technically specified rubber (TSR) and skim rubber. Block rubber has many names depend on producer such as SMR (Standard Malaysian Rubber), SIR (Standard Indonesian Rubber) and TTR (Thai Tested Rubber).

Although Thailand is the major natural rubber producer, the majority of produced and exported rubber is ribbed smoked sheet, which is between 77-82 %, while block rubber is 12-16 %. Most of the ribbed smoked sheet production (86 %) are graded as third and fourth grade which have most various properties. Presently the demand of high quality rubber is increased, the up-grading of rubber by removal of protein will encourage domestic rubber use and in a way improve the rubber price.

1.3 Objectives

1.) To determine the operating conditions for CV-DPNR production from latex clone RRIM 600 using papain in a small scale reactor such as temperature, agitation speed, papain concentration and reaction time. Using the same operating conditions, CV-DPNR will be later produced from different clones of rubber i.e. PB 28/59, PB 5/51 and GT 1.

2.) The CV-DPNR from four different clones of rubber will be tested for their raw rubber properties and physical properties. The results will be compared to that of the control sample (no enzyme treatment) and commercial grades used in Thailand, i.e. TTR 5L, white crepe and RSS 1.

3.) To estimate production cost; the cost consists of field latex, chemicals and utility.