

Preparation and Characterization of Deproteinized Crepe Rubber using a Serin Type Proteolytic Enzyme

T.H.D.S. Chandramali¹, Y.C.Y. Sudusingha^{2*}, S. Siriwardena², E.A.L. Lochana and A.M.W.K. Senevirathna¹

¹*Department of Export Agriculture, Uva Wellassa University, Badulla, Sri Lanka*

^{2*}*Department of Raw Rubber Processing Development & Chemical Engineering, Rubber Research Institute of Sri Lanka, Telewala Road, Ratmalana*

A serin type Proteolytic Enzyme (PE) was used as a substitute for traditionally used papain which has no reliable supply at present in the local market, for the manufacture of Deproteinized Crepe Rubber (DPCR). Field latex was coagulated by different PE dosages varying from 1 to 4 ml with 1 ml intervals per litre of the diluted field latex at 10% DRC and matured for 72 hours. The control sample was coagulated within 24 hours using 1% formic acid and all coagula were converted into pale crepe form. The impact of the maturation period (24-72 hours) on raw rubber properties was also studied using the selected sample which meets the lowest Nitrogen Content (NC) among all the candidate samples. Raw rubber properties, curing characteristics, and physicomechanical properties of all the vulcanizates were studied. All enzyme-treated samples showed lower NC (0.10-0.14% w/w) than the control (0.31% w/w). It was noticed that the increase of PE volume and maturation period reduced the NC in the samples. Raw rubber properties of the enzyme-treated samples with a 72-hour maturation period have complied with the required specifications of DPCR except for the Plastic Retention Index (PRI). It was found a reduction of PRI and ash content while increasing in Po values with the increment of PE dosage and maturation period. However, the enzyme treatment (4ml/liter) with a 24-hour maturation period was able to achieve the slightly higher PRI value (63.3%) than the recommended value (60%) for both control and DPNR. It was found that curing time (T90) of the control sample was higher than the enzyme-treated samples and the control sample showed better tensile strength than the enzyme-treated samples due to the protein reinforcement effect and higher crosslink density. Overall, it could be concluded that the selected enzyme has the potential to use it for manufacturing DPCR.

Keywords: Deproteinized crepe rubber, Nitrogen Content, Maturation period, Raw rubber properties