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Characterization and evaluation of starch xanthide encased powdered natural rubber

by

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A research project thesis submitted in partial fulfilment of the degree of
Master of Science in Polymer Technology

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Abstract

Rubber as a free-flowing powder, is essential in order to stream line the manufacturing processes of rubber goods. The previous works noted the importance of using powdered rubber as a competitive raw material for continuous processing in rubber industry. However, in most of these works, the study was continued to the synthetic rubbers and only a few had been reported on the natural rubber. Sri Lanka which is an agricultural based country, has a bulk quantity of natural rubber field latex at a low price. Hence, it is worthwhile to produce a value-added product like powdered rubber using field latex.

Encapsulation is a common process in preparing powdered natural rubber. In this process, starch xanthate, SX, which acts as a diluent/reinforcing filler, behaves as an encapsulating agent for latex particles. The level of encapsulation as well as the properties of the resulting powder is highly dependent on the strength and the amount of the SX solution. The present work investigates these effects with varying strength of SX by changing the degrees of substitution, DS, of the SX solution and also the loading of the SX.

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The lower and the upper limits of DS of SX examined were 0.07 and 0.35 and the results suggested that the intermediate DS levels were more promising. The physical properties of the final vulcanizates were found to be satisfactory and were comparable with the rubbers available in the market. Study on drying techniques established the necessity of water washing step for natural rubber powders to remove non-rubber substances and the application of an anti-cake agent to prevent agglomeration during drying. The effect of different anti-cake agents such as zinc stearate, talc powder and whiting was examined and zinc stearate was found to be the best out of the anti-cake agents used. Highly friable crumbs that ground readily to give powders were obtained with oven drying rather than with sun drying.

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Nomenclature

A - initial cross-section area

C_b - compression set

DRC - dry rubber content

d - density

E_b - percentage elongation at break

F - breaking force

f - force at the required elongation

L - length between gauge marks at break

L_0 - initial length between gauge marks

m_0 - mass of the test portion

m_1 - mass of the dried sheet

N - normality

T/S - tensile strength at break

TSC - total solids content

t_0 - original thickness of specimen

t_i - final thickness of the specimen

t_n - thickness of the space bar used

V - volume

VFA - Volatile Fatty Acid Number

ρ - specific gravity of the serum

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