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STUDIES ON THE REMOVAL OF NONRUBBER MATERIALS FROM NATURAL RUBBER

AND

THEIR EFFECT ON SOME PROPERTIES OF RAW RUBBER

BY

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ABSTRACT

Several methods of removal of lipids and proteins from raw natural rubber were studied in order to find appropriate methods, which would allow the effect of these two substances on the properties of both unvulcanised and vulcanised natural rubber to be studied. For the removal of lipids, extraction of raw natural rubber with different proportions of chloroform/ethanol mixture, viz, 1/1, 2/1 and 3/2, were made. The 3/2 mixture was found to be the most suitable since it dissolved negligible amount of the rubber while satisfactorily extracted the lipids. For the removal of proteins, water extraction; repeated precipitation of rubber solution in ethanol; acid hydrolysis of proteins by treatment of raw rubber with 6N HCl, both aided and unaided with solvent (toluene) swelling, extraction of sol-rubber with ether for several days; separation of rubber from nonrubber components by centrifugation of rubber latex at 10,000 g and enzymatic degradation of proteins in rubber latex using papain were carried out. Treatment of the rubber latex with enzyme "papain" for 24 hours followed by acid coagulation of the latex proved to be the best method since it reproducibly removed large amount of proteins (1/2 - 2/3 of the proteins present) with little loss of the lipids and could conveniently be applied for large scale preparation of deproteinized rubber sample.

The most effective method for reducing the protein content was centrifugation method (capable of reducing the nitrogen content from 0.4 - 0.5% to well below 0.1% (w/w of rubber). However, besides its effect on the lipid content, this method was not considered a practical method for preparing large amount of sample required for later work. Studies on the effect of nonrubbers on certain properties of raw rubber showed that lipids may act as plasticiser for raw rubber while proteins show no filler effect, in contrast with suggestions from previous studies. Bulk viscosity of the rubber shows no correlation with the gel content. The resistance to thermal oxidative degradation of natural rubber is promoted by nonrubber compounds contained in the lipid extracts but is not affected by metal ions, eg. Cu, Fe, Mn as naturally occurring in the rubber. Storage-hardening of natural rubber was suppressed when the rubbers were extracted with the mixture of chloroform/ethanol, suggesting that either lipids themselves as free amino acids found there in or other unknown nonrubber compounds are responsible for storage cross-linking reactions.