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SUPHANNIPHA NIMSUWAN: A STUDY OF PEROXIDE
VULCANISATION OF PURIFIED NATURAL RUBBER AND ITS PROPERTIES.
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The present thesis is concerned with a study of peroxide vulcanisation of purified natural rubber (PNR) and assessment of the resulting properties. The objective is to explore the suitability of applying natural rubber (NR) for high value-added industrial applications, in particular biomedical applications.

The major concerns relating to the use of NR for biomedical applications are the problems of allergy caused by proteins that are present in NR and also the presence of nitrosamine and nitrosatable amines if an incorrect accelerated sulphur vulcanisation system is used. The above problems may be overcome by using PNR and peroxide vulcanisation system, which is the subject of the present study.

It was found that PNR with a nitrogen content of 0.02% could conveniently be prepared by enzymatic deproteinisation followed by double centrifugation. The resulting PNR could be vulcanised by peroxide to give physical properties comparable to those of the unpurified NR (WNR) and synthetic isoprene rubber (IR). The tensile strengths obtained were in the region of 10 MPa, which are much lower than those obtained by accelerated sulphur vulcanisation system. Attempts were made to improve the properties of the peroxide-cured PNR, and also those of WNR and IR, by using a coagent (trimethylolpropane trimethacrylate) and silica, both with and without silane, but only the latter approach was proven to be successful. With a use of 40 phr of silica, modulus, tensile strength, tear strength and hardness were increased by at least twice. The PNR prepared also showed satisfactory heat ageing properties when peroxide-cured to 98.4% and also better processing properties than the WNR counterpart. Colour of the PNR was lighter than that of WNR, but a light brownish colour tint still persisted particularly after subjecting to heat treatment. Synthetic IR, on the contrary, was completely colourless even after heat treatment. However, PNR exhibited superior sealing properties to WNR and IR.