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CONDUCTING POLYMERS FROM NATURAL RUBBER VIA EXTENDED CONJUGATION

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After the discovery of the world's first conducting polymer- polyacetylene, many conducting polymers have been synthesized for use in several types of electronic devices. Conducting polymers are found in sensors, coatings, biocompatible polymers, batteries, display devices, actuators and many more. As conducting polymers are based on synthetic compounds, some undesirable properties such as reproducibility, stability, difficulty in synthesis, high cost and lack of biodegradability are associated with them. With a view to producing a conducting polymer, devoid of these undesirable properties of synthetic polymers, the conversion of natural rubber into a conducting polymer was explored. Natural rubber is a natural polymer abundantly produced in Sri Lanka from the latex of the rubber plant, *Hevea brasiliensis* (Euphorbiaceae).

Natural rubber has the structure 1,4-*cis*-polyisoprene which may be converted into a conjugated polymer having conducting properties. However, defining the reaction conditions for the conversion is not straightforward because of the polymeric nature of rubber and its association with other compounds in natural form. As a model compound, squalene ($C_{30}H_{50}$) was selected as it has essential structural features of polyolefinic reactivity similar to that of natural rubber.

Thus conditions were first defined for successful bromination of squalene and dehydrobromination of the product. Exhaustive bromination of squalene with Br_2 furnished squalene dodecabromide. Dehydrobromination was achieved by heating a mixture of squalenedodecabromide and methanolic KOH under reflux. The reaction products derived from squalene were characterized using Fourier-Transform infrared spectroscopy (FT-IR) and proton nuclear magnetic resonance (^{1}H-NMR) spectroscopy.

Applying similar conditions on rubber latex that had been stabilised by formaldehyde and nitric acid, bromination of natural rubber was performed to obtain a white compound. Dehydrobromination of the white compound with sodium methoxide provided the conjugated polymer as a bright-yellow coloured compound. The reaction products derived from natural rubber were characterized using FT-IR and thermogravimetric analysis. The yellow polymer prepared from natural rubber displayed a conductivity of the order of 10^{-4} cm^{-1} after exposure to iodine vapour. To the best of our knowledge, this is the first report of a conducting polymer that has been obtained by chemical modification of a natural polymer.