Abstract of the Thesis

Latex protein allergy is a serious problem faced by users of natural rubber latex products. This is severe in health care workers, who are constantly using latex products like examination gloves, surgical gloves etc. Out of the total proteins only a small fraction is extractable and only these proteins cause allergic reactions in sensitized people. Enzymic deproteinisation of latex and leaching and chlorination of latex products are the common methods used to reduce the severity of the problem. Enzyme deproteinisation is a cumbersome process involving high cost and process loss. Physical properties of such films are poor. Leaching is a lengthy process and in leached latex products presence of extractable proteins is observed on further storing. Chlorination causes yellowing of latex products and reduction in tensile properties.

In this context a more simple process of removal of extractable proteins from latex itself was investigated. This thesis reports the application of poly propylene glycol (PPG) to displace extractable proteins from natural latex. PPG is added to 60 % centrifuged natural latex to the extent of 0.2 % m/m, subsequently diluted to 30 % dry rubber content and again concentrated to obtain a low protein latex.

Dilution of concentrated latex and subsequent concentration lead to a total reduction in non-rubber solids in the concentrate, especially proteins and reduction in the ionic concentration in the aqueous phase of the latex. It has been reported that proteins in natural rubber / latex affect its behaviour in the vulcanisation process. Ionic concentration in the aqueous phase of latex influence the stability, viscosity and flow behaviour of natural latex. Hence, a detailed technological evaluation was carried out on this low protein latex.
In this study, low protein latex was compared with single centrifuged latex (the raw material to almost every latex product), double centrifuged latex (because dilution and second concentration of latex is accompanied by protein removal to some extent and reduction in the ionic concentration of the aqueous phase of latex.). Studies were conducted on Sulphur cure in conventional and EV systems under conditions of post-cure and prevulcanisation of latex. Studies were conducted on radiation cure in latex stage. Extractable protein content in vulcanised low protein latex films are observed to be very low. It is observed that this low protein latex is somewhat slower curing than single centrifuged latex, but faster than double centrifuged latex. Modulus of low protein latex films were slightly low. In general physical properties of vulcanised low protein latex films are only slightly lower than single centrifuged latex. Ageing properties of the low protein latex films were satisfactory. Viscosity and flow behaviour of low protein latex is much better than double centrifuged latex and almost comparable to single centrifuged latex.

On observing that the physical properties and flow behaviour of low protein latex was satisfactory, it was used for the preparation of examination gloves and the gloves were evaluated. It is observed that the properties are conforming to the Indian Standard Specifications.

It is thus observed that PPG treatment of natural latex is a simple process of preparing low protein latex. Extractable protein content in these films are very low. The physical properties of the films are comparable to ordinary centrifuged latex and better than conventionally deprotenized latex films. This latex can be used for the production of examination gloves.