Abstract

This thesis presents the findings of a study on incorporating various thermoset resins into natural rubber for property improvement. Natural rubber is an important elastomer with the unique attribute of being a renewable agricultural product. The study was undertaken to investigate the extent to which the drawbacks of natural rubber, especially its poor thermal and oil resistance properties could be nullified by blending with common thermoset resins. A thorough and comparative understanding of the performance of different resins from this viewpoint will be beneficial for both natural rubber processors and consumers. In this study the thermoset resins used were epoxy resin, phenolics, epoxidised phenolics and unsaturated polyester resin.

The resins were incorporated into NR during compounding and their effects on the properties of NR were studied after vulcanization. Properties were studied for both gum and filled NR compounds. The important properties studied are cure characteristics, mechanical properties, ageing properties, thermal properties, crosslink density and extractability. Characterization studies were also conducted using FTIR, TGA and DSC.

Improvement in mechanical properties was noticed in many cases. The results show that most resins lead to a reduction in the cure time of NR. The performance of epoxy resin is most noticeable in this respect. Mechanical properties of the modified rubber show maximum improvement in the case of epoxidised novolacs. Most resins are seen to improve the thermal and oil resistance properties of NR. Epoxy novolacs show maximum effect in this respect also. However the presence of fillers is found to moderate the positive effects of the thermoset resins considerably.