CHAPTER VI
SUMMARY
SUMMARY

PART - I

RECLAIMING OF GROUND RUBBER TIRE (GRT) BY SAFE MULTIFUNCTIONAL RUBBER ADDITIVES: TETRA BENZYL THIURAM DISULFIDE (TBzTD)

The present paper describes the mechanical reclaiming of ground rubber tire (GRT) by safe tetra benzyl thiuram disulfide (TBzTD), a multifunctional rubber additive. The versatility of the proposed agent is that it acts as reclaiming agent during reclaiming and as a curing agent during revulcanization of the reclaimed materials. In this regard, we want to introduce safe reclaiming agent in reclamination of GRT for improving its physical and mechanical performance. Reclaiming of GRT has been carried out in an open roll mixing mill at various time intervals and different concentrations of the reclaiming agent (TBzTD) in presence of spindle oil. The degree of reclaiming have been evaluated by the measurement of sol content, gel content, mooney viscosity, inherent viscosity of sol rubber and degree of crosslink of the reclaimed materials as a function of milling time. Also, the influence of gel content on crosslink density at various time intervals on the open two roll mixing mill has been determined. A unique correlation between gel fraction and crosslink density obtained at various time intervals and concentrations of reclaiming agent indicate that an optimisation of the concentration of safe TBzTD and milling time has a positive influence on improving the efficiency of reclaiming. The reclaiming conditions have been optimized in view of the mechanical properties of the revulcanized GRT and the aging resistance properties of the revulcanized reclaim. The influences of the concentration on the mechanical properties in the revulcanized reclaim have also been studied. Scanning electron microscopy (SEM) studies further indicate the coherency and homogeneity in the revulcanized reclaim rubber when reclamation is carried out by optimum concentration of safe TBzTD after maximum time of reclaiming.

PART - II

RECLAIMING OF GROUND RUBBER TIRE BY SAFE MULTIFUNCTIONAL RUBBER ADDITIVES: I VIRGIN NATURAL RUBBER/RECLAIMED GROUND RUBBER TIRE (GRT) VULCANIZATES
Mechanochemically reclaimed ground rubber tire (GRT) was revulcanized in combination with virgin natural rubber (NR). The NR/GRT vulcanizates with GRT content 20 to 50 wt% was prepared and studied. Reclaiming of GRT was successfully carried out by tetra benzyl thiuram disulfide (TBzTD) in presence of spindle oil at around ambient temperature. The cure characteristics and mechanical properties of the virgin NR/reclaim GRT blend were studied. Increasing the reclaim rubber (RR) content in the blend decreases the optimum cure time without altering the scorch time. Effect of carbon black was studied in NR/RR (80/20) blend vulcanizate for the ultimate use of NR/RR Blend vulcanizate. Aging characteristics of different NR/RR blends were evaluated. The swelling behaviour, thermogravimetric analysis and dynamic mechanical properties of NR/RR blend vulcanizates were examined. The equilibrium swelling of the NR vulcanizates was reduced with increasing reclaim rubber content. Thermal stability of the blend vulcanizates was increased with increase in reclaim rubber content. The elastic and storage modulus of the NR/RR vulcanizates improved with increasing reclaim rubber content. Scanning electron microscopy (SEM) studies further indicate the coherency and homogeneity in the NR/RR vulcanizate.

PART - III
RECLAIMING OF GROUND RUBBER TIRE BY SAFE MULTIFUNCTIONAL RUBBER ADDITIVES: II STYRENE BUTADIENE /RECLAIMED GROUND RUBBER TIRE (GRT) VULCANIZATES

Mechanochemically reclaimed ground rubber tire (GRT) i.e., reclaimed rubber (RR) was revulcanized in combination with Styrene-Butadiene rubber (SBR). The SBR/RR blend vulcanizates with RR content from 20 to 80 wt% was prepared and studied. Reclaiming of GRT was successfully carried out by tetra benzyl thiuram disulfide (TBzTD) in presence of spindle oil at around ambient temperature. The cure characteristics and physical properties of the SBR/RR blend were studied. The optimum cure time decreased but scorch time remain unaltered with increasing reclaim rubber (RR) content in the blend. Effect of carbon black was studied in SBR/RR (80/20) blend vulcanizate for the ultimate use of SBR/RR blend vulcanizate. Aging characteristics of different SBR/RR blends were evaluated. The thermo gravimetric analysis, strain sweep and dynamic mechanical analysis of SBR/RR blend
vulcanizates were examined. Thermal stability of the blend vulcanizates was decreased with increase in reclaim rubber content. Strain sweep analysis was performed to know the reclaim rubber/SBR miscibility. Temperature sweep measurement indicated that the elastic and storage modulus of the SBR/RR vulcanizates improved with increasing reclaim rubber content. Scanning electron microscopy (SEM) analysis was performed to study the coherency and homogeneity in the SBR/RR vulcanizate.

PART - IV

RECLAIMING OF GROUND RUBBER TIRE BY SAFE MULTIFUNCTIONAL RUBBER ADDITIVES: III ACRYLONITRILE BUTADIENE /RECLAIMED GROUND RUBBER TIRE (GRT) VULCANIZATES

Mechanochemically reclaimed ground rubber tire (GRT) i.e., reclaimed rubber (RR) was revulcanized in combination with Acrylonitrile-Butadiene rubber (NBR) to obtain rubber compounds with satisfactory physico-chemical and oil resistance properties. The NBR/RR blend vulcanizates with RR content from 20 to 50 wt% was prepared and studied. Reclaiming of GRT was successfully carried out by tetra benzyl thiuram disulfide (TBzTD) in presence of spindle oil at around ambient temperature. The cure characteristics and physical properties of the NBR/RR blend were studied. The optimum cure time (t90) and scorch time (t2) decreased with increasing reclaim rubber (RR) content in the blend. Effect of carbon black was studied in NBR/RR (80/20) blend vulcanizate for the ultimate use of NBR/RR blend vulcanizate. Aging characteristics of different NBR/RR blends were evaluated. The thermo gravimetric analysis of NBR/RR blend vulcanizates was examined. Oil resistance properties of NBR/RR blend vulcanizates were examined. Thermal stability and oil resistance properties of the blend vulcanizates was decreased with increase in reclaim rubber content at the same time aging resistance property increases with increase in reclaim rubber content. Scanning electron microscopy (SEM) analysis was performed to study the coherency and homogeneity in the NBR/RR vulcanizates. Thus, the results obtained reveal effective improvement in aging resistance property and retention of tensile strength for optimum use of carbon black filled NBR/RR blend vulcanizates.