ABSTRACT

The thesis describes utilisation of reclaimed rubber, Whole Tyre Reclaim (WTR) produced from bio non-degradable solid pollutant scrap and used tyres. In this study an attempt has made to optimize the substitution of virgin rubber with WTR in both natural and synthetic rubber compounds without seriously compromising the important mechanical properties. The WTR is used as potent source of rubber hydrocarbon and carbon black filler. Apart from natural rubber (NR), Butadiene rubber (BR), Styrene butadiene rubber (SBR), Acrylonitrile butadiene rubber (NBR) and Chloroprene rubber (CR) were selected for study, being the most widely used general purpose and specialty rubbers. The compatibility problem was addressed by functionalisation of WTR with maleic anhydride and by using a coupling agent Si69. The blends were systematically evaluated with respect to various mechanical properties. The thermogravimetric analyses were also carried out to evaluate the thermal stability of the blends.

Mechanical properties of the blends were property and matrix dependant. Presence of reinforcing carbon black filler and curatives in the reclaimed rubber improved the mechanical properties with the exception of some of the elastic properties like heat build up, resilience, compression set. When WTR was blended with natural rubber and synthetic rubbers, as the concentration of the low molecular weight, depolymerised WTR was increased above 46-weight percent, the properties deteriorates.

When WTR was blended with crystallizing rubbers such as natural rubber and chloroprene rubber, properties like tensile strength, ultimate elongation were decreased in presence of WTR. Where as in the case of
blends of WTR with non-crystallizing rubbers reinforcement effect was more prominent.

The effect of functionalisation and coupling agent was studied in three matrices having different levels of polarity (NBR, CR and SBR). The grafting of maleic anhydride on to WTR definitely improved the properties of its blends with NBR, CR and SBR, the effect being prominent in Chloroprene rubber.

Improvement in properties of these blends could also achieved by using a coupling agent Si69. With this there is apparent plasticizing effect at higher loading of the coupling agent. The optimum concentration of Si69 was 1 phr for improved properties, though the improvements are not as significant as in the case of maleic anhydride grafting.

Thermal stability of the blend was increased by using silane-coupling agent.