ABSTRACT

The most conventional, easier, low expensive method of physically blended NBR and other speciality elastomers like CSM (Hypalon-40), Polysulphide (Thiokol-FA), Epichlorohydrin (Gechron-3100), ACM (Nipol AR-51) and Fluoroelastomer (Viton-B-50) with and without curatives as well as black filled blends have been studied throughout the entire composition range. The effect of blending technique and interchain crosslinking on the flow behaviour and morphology of the above blends have been examined as a function of shear rate and blend composition. Rheological parameters like shear modulus, maximum recoverable deformation, stored elastic energy, relaxation time and modified weissenberg number have been determined. The effect of blend ratio has been investigated with respect to cure behaviour, physical, chemical and thermal properties. Ageing in air, ASTM oil-3 and ozone have also been examined. Physical properties are shown to be related to the blend composition and the blending technique. Dynamic mechanical analysis and Differential scanning calometry have been employed for the miscibility study which are further related to the interchain crosslinking. Morphology and fracture mechanism of the blends have been reported using scanning electron microscope (SEM) after differential solvent swelling and tensile fracture.

Mainly, the blending technique governs the flow behaviour, cure characteristics, physical and thermal properties of the blends. In most cases phase adhesion are observed when the blends are heated prior to compounding. The

masterbatch technique in all the cases renders inferior properties to that of preblending technique and similarly the preheating of the blends results superior properties to the preblends of without heating. The variation in technical properties with the sequences of black incorporation in the blends and the individual polymer has been studied here. Optimization of the blend ratios in the blend have been done for the useful application in all the systems.

Blending technique plays a major role in determining the physical properties of the blends and thereby controls the phase morphology, failure mode and the degradation pattern. The blend morphology has a marked effect on the extrudate swell affecting the rheological behaviour. Details of the reaction mechanism of the interchain crosslinking due to heat effect in all the systems have been proposed with the help of FTIR and IR spectral analysis.

Key words : Polyblends, Preblend, Preheated blend, Masterbatch technique, Interchain crosslinking, NBR, Hypalon, Thiokol, Polyacrylic rubber, Viton, Rheology, Extrudate swell, Relaxation time, Flow behaviour, Viscosity, Power-law index, Pseudoplasticity, Blend morphology, Miscibility, Capillary rheometry, DIAK-3.