ABSTRACT

The curing of polyacrylic rubber (NIPOL-AR-51) in the presence of metal oxides and rubber accelerators like ethylene thiourea (ETU), mercaptobenzothiazole (MBT), sulfenamides, blocked diamine (Diak No.3), ammonium benzoate (AB) etc. have been studied with a view to elucidate the crosslinking mechanism with special reference to the role of metal oxides. Effort has also been made to explore the reinforcement mechanism of different fillers such as carbon black (SRF N770), silica (Vulkasil-S) and precipitated calcium carbonate when used alone and in combination. The covulcanization of polyacrylic rubber and carboxylated nitrile rubber blend (50:50) has also been examined in the presence of metal oxides.

The effect of different mole ratios of metal oxide to accelerator has been investigated with respect to cure behaviour, physical, chemical and thermal properties. Continuous cure characteristics are studied employing a Monsanto Rheometer and vulcanizate properties are evaluated in terms of tensile testing, solvent swelling, aging and thermal analysis (viz. DTA and TGA). The most effective mole ratios of metal oxide to accelerator have been found to be (a) PbO:ETU = 1:1 ; (b) CdO:ETU = 3:2 ; (c) PbO:MBT = 2:1 ; (d) PbO:AB = 1:2 and (e) PbO:Diak No.3 = 4:1.

Morphology and fracture mechanism of the vulcanizates have been studied using a scanning electron microscope (SEM). Spectral (viz. IR, XRD, XPS) as well as chemical analyses have been employed to investigate the curing mechanism. The C-Cl bond

of the polyacrylic rubber acts as the cure site. The metal oxide facilitates the crosslinking through the formation of metal chloride. Carbon black provides a better degree of reinforcement (α_f) than both calcium carbonate and silica in the systems containing CBS , AB or Diak No.3 in the presence of PbO. The efficiency of silica filler is improved to a considerable extent with the addition of a suitable coupling agent (viz. methylene dianiline).Based on spectral and chemical analysis mechanistic schemes have been put forward in each of the cure system.

Key words : Polyacrylic rubber, Carboxylated nitrile rubber, Metal oxides, Ethylene thiourea, Sulfenamides, Mercapto Benzothiazole, Ammonium Benzoate, Diak No.3, SRF (N770), Vulkasil-S, Precipitated calcium carbonate, XRD, XPS, SEM, IR, FTIR.