ABSTRACT

The role of Phosphorylated Cashew Nut Shell Liquid (PCNSL) prepolymer as a 'multifunctional additive'(MFA) in Natural Rubber (NR) has been studied with special reference to processability characteristics of the mixes and physico-mechanical properties of the vulcanizates. Studies in a Brabender Plasticorder and a Monsanto Processability Tester have shown considerable plasticizing effect of PCNSL in NR in the concentration range of 10 to 20 phr. The improvement in the self adhesion strength (tack strength) of PCNSL modified NR measured by the 180° peel test has been attributed to the enhanced interfacial diffusion of NR in presence of PCNSL. NR vulcanizates containing 10 phr of PCNSL vulcanized by semi-efficient vulcanization (SEV) system showed higher physico-mechanical properties, resistance to fatigue failure and thermo-oxidative decomposition as compared to the conventional (CV) and efficient (EV) vulcanization systems at an optimal ZnO/PCNSL ratio of 1 and compared to vulcanizates without PCNSL. Elucidation of the network structure of PCNSL modified NR vulcanizates using the determination of chemical crosslink density (CLD) by equilibrium swelling method and chemical probes indicated a complex network structure with extra-network materials. The probable formation of entanglements between the aliphatic side chain of PCNSL and the NR chains is thought to account for the improved tensile and elongation properties despite a reduction in the total CLD.Thermal analysis of the PCNSL modified NR vulcanizates using TGA, DSC and DTA showed improved resistance to thermal and thermo-oxidative decomposition of the vulcanizates in air, in presence of 10 phr of PCNSL.

Key Words:- Phosphorylated Cashew Nut Shell Liquid, Multifunctional additive, Natural Rubber, Processability, Physico-mechanical properties, Self adhesion strength, Network structure, Thermo-oxidative decomposition.