

## ABSTRACT

The present work describes the preparation of rubber-rubber blends and rubber-plastic blends from acrylic rubber (ACM), fluorocarbon rubber (FKM) and multifunctional acrylate plastics for high temperature and fluid resistance purposes. The miscibility of ACM/FKM blend has been characterized by infrared spectroscopy (IR) studies, nuclear magnetic resonance spectroscopy (NMR), differential scanning calorimetry (DSC) and dynamic mechanical thermal analysis (DMTA). The blends are found to be miscible through strong specific interaction in all composition ranges and show single glass transition temperature. The mechanical properties are accordingly enhanced. The gum and filled blends exhibit pseudo plastic flow behavior. The equilibrium die swell of the filled blends changes with different fillers and loading of carbon black. The mechanical properties of the filled blends are improved linearly with filler loading. The blends show better cure characteristics with mixed curing system consisting of hexamethylenediamine carbamate (DIAK #1) and ammonium benzoate. Addition of reinforcing fillers and their loading influenced the cure properties with increased torque and reduced scorch safety. The gum and filled 50/50 (w/w) ACM/FKM blends show overall performance in strength properties.

Novel thermoplastic elastomers developed from binary and ternary blends of ACM, FKM and multifunctional acrylates by in-situ polymerization technique show improvement in mechanical properties and retention of strength properties after thermal aging. All the blends show thermoplastic elastomeric characteristics. Best mechanical properties are obtained for 50/50/30 (w/w) ACM/FKM/p-TMPTA. The dynamic mechanical thermal analysis indicates the presence of single  $T_g$  with respect to ACM/FKM blend with minor transition for multifunctional acrylate phase. Transmission electron microscopy (TEM) reveals the presence of a single-phase structure for both ACM/FKM and ACM/polyacrylate binary blends and multi-phase structure for the ternary blends. The FKM forms the dispersed phase with poly-nodal particle distribution. Thermogravimetric analysis of the blends containing polyacrylate indicates higher thermal stability by shifting initiation of degradation to higher temperature. Polyacrylates with the higher functionality show multi-step processes of degradation. Swelling studies depict higher swelling resistance of ACM and FKM blended with polyacrylate. The rheological, dynamic mechanical and viscoelastic behaviors of the ACM/FKM blends containing multifunctional acrylates reveal the dependency of shear modulus and dynamic viscosity on compositions of ACM and FKM. The stress relaxation measurement indicates the viscoelastic nature of the blends with exponential decay of stress in the beginning followed by logarithmic decay at latter time. Addition of fillers increases tensile and tear strengths with reduction in elongation at break without affecting tension set. Dynamic vulcanization of ternary blends marginally improves the mechanical properties before and after aging.