Study on the Morphology, Rheology and Dynamic Mechanical Properties of Oil Extended EPDM/PP Thermoplastic Vulcanizates

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ABSTRACT

Attempts have been made to study the effects of esteric plasticizers such as Di-Octyl Sebacate (DOS), upon the morphology, rheology, viscoelastic and mechanical properties of EPDM/PP (60/40) thermoplastic vulcanizates. To study the morphology during melt mixing, in an internal Haake mixer, small samples were taken from the mixer without interruption of the mixing and quickly quenching in cooled water prior the dynamic vulcanization. The morphology of the samples was examined by Scanning Electron Microscopy (SEM) and two-phase morphology with the rubber particles dispersed throughout the PP matrix was observed for both sample series taken before and after dynamic vulcanization. The SEM micrographs showed that the routes of oil feeding in the blend due to its effect upon the viscosity ratios and also enhancement of slippage during melt-melt mixing have a great effect on the rubber particles size. Oil distribution in each phase was studied using Dynamic Mechanical Thermal Analysis (DMTA),and mechanical properties were confirmed by SEM micrographs. The results showed that in blends containing 80 phr DOS which plasticizer was first masterbatched with EPDM, the lower temperature damping peak appears about -50 °C. The decrease in EPDM phase glass transition temperature (Tg), tensile modulus, hardness and tensile strength and increase in rubbery behavior of the sample blends was observed with increase in plasticizer concentration. The Rheometric Mechanical Spectroscopy (RMS) and capillary rheometer were employed to study the rheological behavior of the blends. The power law behavior was seen in all sample blends.

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