International Journal of Polymeric Materials

Volume 56, Issue 10, 2007

Physico-Mechanical, Aging Properties, and Permeability of Ketones Through Vulcanizates Prepared by Different Mixing Schemes

A. K. Akinlabi

Department of Chemistry, Federal University of Agriculture, PMB 2240, Abeokuta, Ogun State, Nigeria

Abstract

This article reports on the physico-mechanical properties, chemical resistance, aging properties, sorption, diffusion, and permeability of ketones (cyclohexanone and acetone) through vulcanizates from blends of natural rubber (NR) and epoxidized low molecular weight natural rubber (ELMWNR) compounded by three different mixing schemes. The compounding ingredients were mixed with the two mentioned rubbers using three different mixing schemes by adopting a semi-efficient sulphur vulcanization compounding formulation. In Scheme 1, the natural rubber and ELMWNR were first mixed before adding the compounding ingredients. In Scheme 2, the compounding ingredients were first mixed with the NR before adding the ELWMNR and in Scheme 3, the compounding ingredients were first mixed with the ELMWNR before adding the NR. The physico-mechanical results of the vulcanizates showed that changes in the mixing schemes significantly influence the tensile properties of the vulcanizates. The tensile strength of the vulcanizates prepared with mixing Scheme 2 were 4.3 MPa lower than vulcanizates from Scheme 1, whereas Scheme 3 was lower than Scheme 1 with 8.5 MPa. The aging results of the vulcanizates from all the mixing schemes were found impressing. The activation energy and free energy change were highest for Scheme 1 whereas the extent of cyclohexanone and acetone penetrations were the lowest with Scheme 1, signifying well crosslinked and ketone resistant vulcanizates.

Keywords

compounding, diffusion, mixing schemes, natural rubber, vulcanization