THE EFFECT ORGANIC PEROXIDES ON THE MOLECULAR COMPOSITION OF HETEROPHASIC ETHYLENE-PROPYLENE COPOLYMERS (HEPCS)

SI Magagula and AJ van Reenen

Department of Chemistry and Polymer Science; University of Stellenbosch, Stellenbosch, South Africa

ABSTRACT

HEPCs are commercially important materials, and the fundamental understanding of the processes and chemistry that affects the final macroscopic properties of these materials needs to be expanded. HEPCs are complex materials comprising three main components, these being a highly crystalline material (isotactic polypropylene); a rubbery component (mostly amorphous ethylene-propylene copolymers) and a partially crystalline yet chemically heterogeneous component that comprises of "blocky" ethylene-propylene copolymers [1]. The latter component acts as a compatibilizer between the rubbery and the highly crystalline components [2].

A recent study [3] has revealed that specific organic peroxides had different effects on the molecular make-up and properties of the products produced by reacting the HEPCs with peroxides. The main focus of the current study is to understand why specific organic peroxides interact/ influence the various components of HEPCs differently. Two HEPCs (two different ethylene contents) were fractionated, into three fractions (30, 100, 130 °C) using Temperature rising elution fractionation. The fractions were independently reacted with two chemically similar, yet structurally different peroxides (*Trigonox®101 and Trigonox®301*). The reacted fractions were characterized with high temperature size exclusion chromatography (HT-SEC), Fourier transform infrared spectroscopy (FTIR), Differential scanning calorimetry (DSC) and Carbon-13 nuclear magnetic resonance spectroscopy (^{13}C NMR). The results obtained, revealed that *Trigonox®101* affected the propylene-rich sequences more than the ethylene sequences, whilst the opposite was observed for *Trigonox®301*. When the solubility parameters of the peroxides were calculated, *Trigonox®101* was found to be highly miscible with polypropylene relative to polyethylene, whilst the opposite was observed for *Trigonox®301*. Therefore this correlated well with the results obtained from the reacted fractions.

References:

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2. Cheruthazhekatt S, Pijpers TF, Harding GW, Mathot VB, Pasch H Macromolecules 2012;45(4):2025-2034.
3. Swart M The effect of controlled degradation with an organic peroxide on the molecular characteristics and properties of heterophasic propylene-ethylene copolymers (HECO) 2013.