

## **DEVELOPMENT OF STRUCTURE-PROPERTY RELATIONSHIPS IN COMMERCIAL HETEROPHASIC ETHYLENE PROPYLENE COPOLYMERS (HEPC)**

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### **ABSTRACT**

The development of commercial heterophasic ethylene propylene copolymers (HEPCs) obtained during a transition from homopolymer to the final copolymer product was previously evaluated in terms of morphology, chemical composition, crystallinity distribution, microstructure, and molecular dynamics. Changes in the polymer mechanical properties were observed with increasing ethylene incorporation indicating a general trend of increased impact strength and decreased stiffness up to a certain optimum ethylene content. These results were related to the rubber particle size and distribution in moulded samples as well as the previously observed morphological development in the nascent polymer. Variable temperature solid-state <sup>13</sup>C NMR experiments were used to observe temperature-dependent shifts in localised mobility, which were related to the molecular dynamics of the different phases in the bulk samples. T<sub>1ρ</sub> experiments were also used to differentiate between changes in the crystalline and amorphous phases during the development of these polymers. In this feature article, the highlights from these observations from the perspective of the solid-state analyses are outlined and placed in the context of previous results pertaining to the microscopic and chemical evolution to propose a model for the development of the nascent polymer and its effects on the mechanical behaviour.