MICROHARDNESS OF RANDOM COPOLYMERS OF BUTENE-1 WITH ETHYLENE OR PROPYLENE

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ABSTRACT

Compared to isotactic polybutene-1 (iPB-1), random copolymers of butene-1 with minor amount of 1-alkene co-units are preferred on industrial scale because of easier processing, but also due to the opportunity to tailor properties and the crystallization process on melt-solidification. For iPB-1 it is known that on cooling the melt there is first formation of a Form II mesophase which then slowly transforms into Form I crystals within several days. The insertion of either ethylene or propylene co-units was demonstrated to be a beneficial tool to control the kinetics of the Form II mesophase/Form I crystal transition but also the maximum achievable crystallinity. Both the presence of specific crystal polymorphs and the crystallinity have major impact on the mechanical property profile. In the present work an attempt is made to correlate these structural parameters to the mechanical performance of butene-1/ethylene and butene-1/propylene random copolymers of different co-unit concentration. In particular, time-resolved measurements of the microhardness were preformed to follow the effect of the phase transition from the Form II mesophase into Form I crystals on the mechanical behavior. Analysis of the microhardness after completion of the phase transition permitted to establish a link with the crystallinity in butene-1/ethylene copolymers, and with the crystal perfection (co-unit inclusion) in butene-1/propylene copolymers.

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