THE MODIFICATION OF AMORPHOUS PHASE OF POLYPROPYLENE–THE IMPACT ON THE SELECTED PROPERTIES

Artur Krajenta[a], Artur Rozanski[a]

[a]Department of Polymer Physics, Centre of Molecular and Macromolecular Studies, Polish Academy of Sciences, Sienkiewicza 112, 90-363 Lodz, Poland, e-mail: krajenta@cbmm.lodz.pl

ABSTRACT

Many years of intensive studies on semicrystalline polymers carried out by many researchers show that they are interesting because of their complicated structure and unique properties. Polymers such as polyethylene, polypropylene, polyamide 6, poly(methylene oxide) or biodegradable ones like polylactide belong to the groups of semicrystalline polymers, which are now widely used in industry or towards which there are strong hopes for the future. Research conducted in many research centers in Poland and all around the world, concerning the above-mentioned groups of polymers related mostly to the crystalline phase. Undertaking the study on the amorphous phase of such materials that constitute an integral part of the structure of each mentioned polymer and often decides about the macroscopic properties of a particular material, seems to be exceptionally purposeful.

The effect that the additives, low molecular weight fractions [1] and the presence of low molecular weight modifiers in the amorphous phase [2] have on physical properties of semicrystalline polymers during tensile drawing was studied in the past. The addition of modifier changes the physical state of amorphous phase and mechanical response of such polymer-modifier system in relation to the reference (pure) material. In view of the instability of the polymer-modifier systems investigated previously (i.e. polypropylene-chloroform) caused by desorption of modifier in laboratory conditions, a new system characterized by higher stability with aliphatic hydrocarbon–nonadecane as a modifier was developed.

For the polypropylene-nonadecane system we have examined the influence of the presence of modifier on structure, physical state of the amorphous phase and selected macroscopic properties of the polymer matrix:

- intensity of cavitation phenomenon,
- thermo–mechanical properties.

We have observed the decrease of the value of Young modulus and yield stress (similar effect has been observed and explained in case of polypropylene-chloroform system [3]) and reduction of intensity of cavitation phenomenon in modified samples connected with filling of free volume pores of the amorphous phase.

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References

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