DEFORMATIVE PROPERTIES OF RECYCLABLE ETHYLENE-OCTENE COPOLYMER (EOC)/ HIGH DENSITY POLYETHYLENE (HDPE) BLENDS

RECIKLĒJAMU ETILĒNA-OKTĒNA KOPOLIMĒRA (EOK)/ AUGSTA BLĪVUMA POLIETILĒNA (ABPE) MAISĪJUMU DEFORMATĪVĀS ĪPAŠĪBAS

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Considering growing global plastic consumption, which have increased more than seven times in comparison to synthetic polymer use in 1970, the amount of plastic waste, particularly that of used poly(ethylene terephtalate), high density polyethylene (HDPE) and low density polyethylene (LDPE) packaging have also raised. Consequently recycling of generated polymeric waste according to stringent EU rules is necessary. From plastic recycling methods, in its turn, polymer blend forming technology should be preferred. Development of such multi-functional systems allows not only reduce costs of the materials, but also broaden its application potential and design materials with predictable properties, conforming specific needs of the customer. Especially actual is development of polyethylene blends with new-generation thermoplastic elastomers, such as ethylene-octene copolymer (EOC), taking into the account their extensive use and high demand in construction, building and automotive industries.

Introduction of EOC into HDPE containing thermoplastic compositions, allows substantially improve processing characteristics of the blends as well as rise it toughness and impact strength, thus substantially extending applicability of the investigated composition systems. Increase of the content of high modulus component (HDPE), leads to improved short- and long term behaviour of the EOC containing compositions. Especially important is recyclability of the blend components, allowing development of the microheterogenoulsly structured multiphase systems from post-consumer materials, as well as enabling it repeated processing. Thus large part of polymer waste (polyolefines form more than a half of polymeric waste) can be successfully turned into usable products with unique properties.

Microheterogeneous compositions of HDPE with EOC were obtained in a broad blend content range (10/90, 30/70, 50/50, 70/30, 90/10 komponentu masas procentos). Stress-strain characteristics, melt flow rate as well as melting characteristics (melting temperature, glass transition temperature and crystallinity) of these blends were examined. Especial attention was devoted to detailed analysis of elastic modulus and stress-strain characteristics (yield stress and yield strain, ultimate stress and ultimate strain), as well as to structure-property relationship.

Results obtained during the investigations testify that by increasing HDPE content in the blends, change of the rupture characteristics from superelastic to quasibrittle takes place, accompanied by the growth of the stiffness (by the factor greater than 30) and yield strength (from 2 up to 25 MPa) of the system. It should be mentioned that these great changes are most probably due to the growth of the total crystallinity of the blends, observed by the addition of high modulus component in the system. This in its turn, testify, that unique multifunctional thermoplastic systems have been obtained.

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