THERMOMECHANICAL AND ADHESIVE PROPERTIES OF RADIATION-MODIFIED POLYMERIC BLENDS FOR THERMOSHRINKABLE PRODUCTS*

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The work is devoted to investigation of gamma-irradiated blends of polyethylene (PE) with ethylene/propylene/diene copolymer (EPDM) and thermotropic liquid-crystalline polymer (LCP). It is known that irradiation not only improves the overall mechanical properties, but also allows us to obtain unique heat-shrinkable products. Recent investigation [1] showed that addition of EPDM to PE not only improves elasticity (flexibility) of thermosetting materials, but also increases their adhesive interaction with steel. However, the values of residual setting stresses induced by isometrical heating and cooling decrease with increasing EPDM content in the PE + EPDM blend. On the other hand, we have shown [2] that even a relatively small amount of a LCP may improve substantially the drawability of the irradiated PE+LCP at a temperature above the PE melting point and also increase the thermorelaxation and residual setting stresses at isometrical heating and cooling the previously irradiated and oriented samples.

The aim of the present work was to study the properties of irradiated ternary PE+EPDM+LCP blends. The work was focused on the evaluation of the capability to improve the service performance of thermoshrinkable polymeric products. The morphology, thermal and mechanical properties in a wide range of temperature were investigated for samples containing different amounts of PE and EPDM, as well as a small LCP addition. Features of the thermomechanical properties of PE+EPDM+LCP blends previously irradiated and oriented, particularly the thermorelaxation and residual setting stresses at isometrical heating and cooling, were established. An addition of LCP to PE+EPDM increases significantly the dimensional stability of oriented samples and elevates the values of the residual setting stresses. Moreover, EPDM and LCP additions improve adhesive interaction with steel. The thermomechanical properties of the ternary blends investigated agree, in general, with the results of the morphology and calorimetric tests. On the whole, the results obtained testify that the addition of LCP and EPDM to PE makes it possible to vary purposefully the thermosetting and adhesive properties of thermoshrinkable polymeric products.

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References

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