

**Styrene-isoprene-styrene block copolymer modified with boron derivative
as a compatibilizer of low density polyethylene/polystyrene blends
and polypropylene/polystyrene blends**

ABSTRACT

In the process of functionalization carried out at increased temperature and inert gas atmosphere, compatibilizers on the basis of a styrene-isoprene-styrene block copolymer (SIS) modified with boron derivative: 9-borabicyclo[3.3.1]nonane (9-BBN) were obtained. The amount of 9-BBN which was used to modify the SIS copolymer was from 2wt% to 10wt%. The FTIR, NMR and iodine number results confirmed decomposition of the boron dimer and its addition to the tertiary carbon atom which is present in the diene block of the SIS copolymer.

In the next stage of work polyolefin/polystyrene blends of different quantity (50/50 and 25/75) and quality composition with the addition of synthesized SIS/9-BBN compatibilizers and for comparison with unmodified SIS copolymer were obtained. Two basic olefin polymers differing in chemical structure and properties, i.e. low-density polyethylene (LDPE) and isotactic polypropylene (PP) were selected for the study. The content of compatibilizers in the polymer blends was from 2wt% to 10wt%.

The structure of the obtained polymer blends was investigated by SEM and TEM microscopy. Additionally, mechanical properties (tensile test, flexural test and impact strength), thermal properties (DSC, TGA, DMTA) and rheological parameters of the obtained polymer blends were measured.

The results of mechanical properties indicate higher strength and impact strength of polyolefin/polystyrene blends with the addition of SIS/9-BBN in comparison to the control sample. DSC analysis of LDPE/PS and PP/PS blends (50/50 and 25/75) before and after modification with SIS 9-BBN additive showed changes in the polyethylene phase (increased crystallinity, change in T_m) and polystyrene phase (shift T_g values to higher temperature ranges), which can be explained by the positive effect of the compatibilizer on interfacial

adhesion between polymers. LDPE/PS and PP/PS (50/50 and 25/75) blends after modification with SIS/9-BBN were also characterized by higher thermal stability compared to the control sample.

The occurrence of additional beneficial interactions related to the presence of the SIS/9-BBN compatibilizer in LDPE/PS and PP/PS blends and their affecting mechanical properties has been confirmed by supplementary microscopic analysis (image of the phase border before and after extraction with chloroform), DMTA analysis (change of intensity and temperatures of relaxation) and the analysis of rheological parameters.

The studies also showed that the use of an unmodified SIS copolymer in the process of compatibilization of polyolefin/polystyrene blends leads only to the plasticization of the polymeric material.

It has been shown that the application of the SIS/9-BBN compatibilizer marked by mod.08 in the amount of 4wt% allows to obtain polymeric material with better strength which may have various practical applications.