MODIFICATION OF THE PROPERTIES OF POLYOLEFINS WITH LOW AND HIGH MOLECULAR MASS ADDITIVES

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Abstract

For about 10 years intense research work has been going on for the modification of the properties of polyolefins. The effect of surfactants, elastomers and filling materials has primarily been investigated upon semicrystalline polyolefins. Studies on interfacial interactions as well as on deformation mechanisms enabled the prediction of the properties of polymers. By determining the rules of modification, the interfacial interactions and the structure of the interfacial layer new polymer compositions called MODYLEN product family with favourable properties have been developed.

Recently increasing attention has been focussed on methods for modifying the properties of polymers. For this purpose the relatively simple physical methods are considered to be among the most economic ones. Due to the wide variety of physical methods and to the great number of additives, the properties can be widely varied and polymer systems developed in this way find increasingly widespread application.

For the production of polyolefin based composite systems a thorough research work started in cooperation with the Tisza Chemical Works already in the early 70s. The aim of the work was to elaborate modified polyolefin products for satsfying the claims of users for a wider range of choice and to improve the properties and processability of the products, compared to the base polymer. The modification of various polyolefins can be achieved by mineral filling materials as well as with low and high molecular mass additives.

We succeeded in developing a process for modifying the product properties on a large scale using a simple and economic technology [1]. This method has been licensed in about 25 countries so far. The above process requires a thorough knowledge of the rules governing the modification of polyolefins.

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The elucidation of the rules of modification require examinations with the aim to establish correlation between the composition, structure and properties of polymer compounds [2—6]. Optimization with respect to the nature and proportions of additives is enabled by studying the arrangement of the components and the interfacial interactions. Surfactants applied as additives of low molecular mass affect basically the interactions between the components and also the rheological behaviour of the system. Elastomeric additives yield a considerable decrease in the stresses developed at the interface of the filling material and the polymer.

For the interpretation of microscopic processes taking place upon deformation in composite systems, a deformation model has been elaborated by which the change in physicomechanical characteristics can be well explained. By choosing the appropriate additive in a suitable quantity, one can influence the structure of interface in composite polymer systems on the basis of the correlation existing between the composition and/or structure and properties of additives. This provides the requested modification of the deformation mechanism and of the final characteristics, as well.

Our research work resulted in the elaboration of a new product family called TVK MODYLEN [7].

The different types of the product family offer significant technological advantages in various fields like the production of special structural materials, fibres and layered wrapping materials. Using general purpose polypropylene a material of a cold resistance and high elastic modulus could be produved which was suitable to replace several valuable import stuff used in vehicle and wrapping industry. These specific products (fibres, ribbons, films) dispose of exceptional strength and almost arbitrarily regulable fibrillation tendency. One example of these is the bale tying string made of fibrilled film fibres produced by the MODYLEN method. This product assures a considerable foreign currency saving in the agriculture and at the same time its export possibilities have been extended.

In addition to the improvement of the product properties by applying composite systems, processing has also been facilitated in several fields (e.g. film extrusion, extrusion coating).

The MODYLEN product family was awarded with the grand prix at the Budapest International Fair in 1986, while their inventors, Dr. I. Rusznák and Dr. G. Bertalan were given the prize for creative work.

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