

## DEVELOPMENT OF PRACTICALLY USABLE MATERIALS FROM POLYETHYLENE TEREPHTHALATE BOTTLE WASTE

### PRAKTISKI IZMANTOJAMU MATERIĀLU IZVEIDE NO POLIETILĒNTEREFTALĀTA PUDEĻU ATKRITUMIEM

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**Summary:** Implementation of the products from recycled PET bottles in the Latvian market should be promoted. In order to achieve this goal, secondary blends, obtained from PET base material as well as polyolefine closures and labels, were investigated. Results of the investigation show that properties of the thermoplastic composites are sufficient to use them according to the specific needs of the customer.

Through years poly(ethylene terephthalate) (PET) has become a proven alternative to alternative packaging materials such as metals, glass and paper. Nowadays it is among most popular food packaging materials (production of PET resin in 2005 (EU countries) has been close to 4 million t). Simultaneously PET is one of the fastest growing polymeric materials in the world with annual growth rate of 10 % per year. Consequently amount of the annual generation of PET waste is considerable. Following the European packaging Directive (2004/12/62/EC), different recycling procedures of PET packaging waste has been developed. Most popular methods for recycling of PET packaging waste utilize several routes of (1) mechanical recycling, (2) depolymerization as well as (3) thermal recovery.

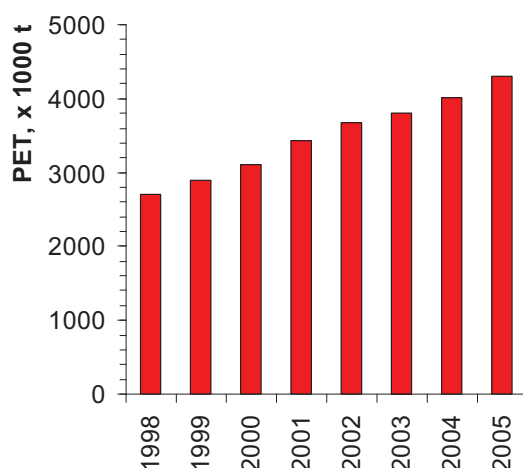


Fig.1. Growth of PET consumption through years

Although PET bottle recyclates globally are already applied in the traditional virgin markets (both in food as well as non-food applications), introduction of these knowledge in the Latvian industrial sector is extremely important, while at present moment recycling of PET bottle waste in Latvia is in its developing stage. Therefore, implementation of the products from recycled PET bottles in the Latvian market should be promoted through development of certain technological procedures as well as through investigation of the materials, obtained by using these technologies. Especially attractive is recycling of PET bottles without the need of separation of its constituents, i.e., PET base bottle, polyolefine closures and labels (mainly polypropylene (PP), polyethylene (PE) and polyethylene copolymers). Exploitation properties of such composites, however, are highly dependent on the compatibility of its constituents as well as on the components ratio. Taking into account varying composition of the plastic waste stream, as well as incompatibility of PET with polyolefines, recyclers are interested in the development of technologically reliable thermoplastic composite systems with predictable properties.

In order to achieve this goal secondary PET, obtained from post consumer soft drink and beer bottles, was melt blended with mechanical mixture of polyolefines (PE, PP), obtained from bottle closures and labels. Polypropylene grafted maleic anhydride compatibilizer was simultaneously added to increase compatibility of PET with polyolefines. Short- and long term (creep) stress-strain properties, as well as certain physical and

calorimetric characteristics of these composites were evaluated and relationships between structure and properties were analyzed.

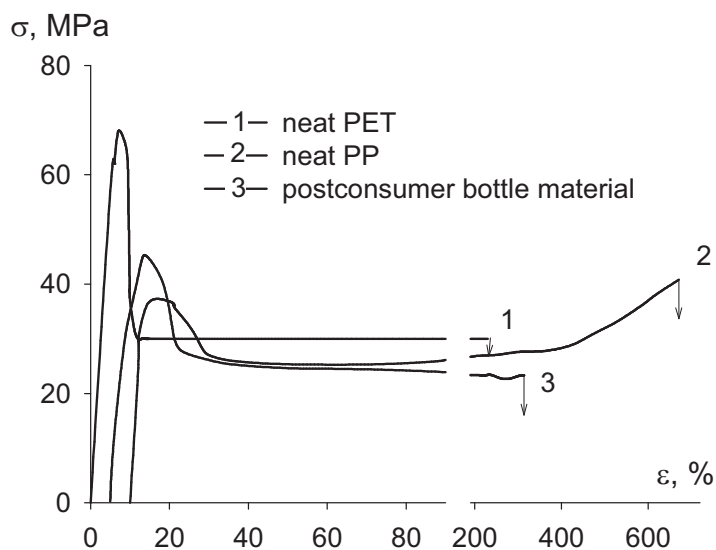


Fig. 2. Stress-strain diagrams of neat PET (1), neat PP (2) and post-consumer blend based on PET bottle and polyolefin closure waste (3).

Results of the investigation show that properties of the composites are sufficient to use them according the specific needs of the customer.

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