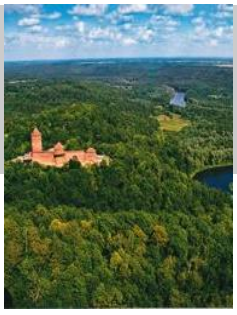
BALTIC POLYMER SYMPOSIUM

2015

PROGRAMME AND PROCEEDINGS



Sigulda, Latvia, September 16-18

Institute of Polymer Materials

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Latvian State Institute of Wood Chemistry

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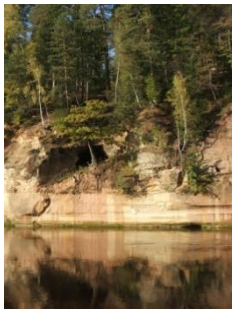

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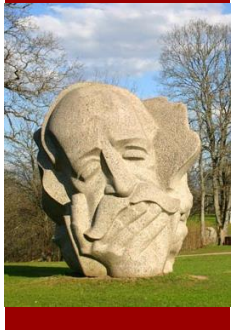

POLYMER-SAND PRODUCTS BASED ON THE MIXED AND HEAVILY CONTAMINATED THERMOPLASTIC WASTE

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An alternative method of recycling the mixed and contaminated polyolefin waste (PE, PP) in industry is the production technology of polymer-sand products, which does not require deep cleaning and sorting of raw materials. Such polymer-sand products have a low physical-mechanical properties, low softening temperature, high flammability, low ultraviolet radiation resistance which limits their use. On the basis of the conducted exploratory research for obtaining polymer-sand products with improved mechanical and operational characteristics polyethyleneterephthalate was used as a polymer matrix. A considerable number of PET waste is heavily contaminated and mixed with other polymers (PVC, PA, polyolefins) materials which are advisable to be processed by means of filling with sand and they are the ideal basis for creating polymer-sand products.

For research were used: PE-15803-020 of «Polymir» production (PE), ExxonMobil™ LLDPE LL 4004EL Wire&Cable (LLDPE), stretch, PET 8200, secondary waste of pneumatic moulding of PET in the form of flakes(R-PET), polyethyleneterephthalate glycol-modified (PETG), polycarbonate TRIREX (PC), graft copolymer of polyethylene with maleic anhydride (PE-g-MA), synthesized in laboratory conditions; silane Dynasylan® AMEO Evonik Industries AG Inorganic Materials and rivers and without impurities. For the experiment, each polymer was ground by a rotary grinders into a powder to obtain a homogeneous system of polymer-sand and was subjected to drying in order to prevent degradation of the polymer. The sand used was of a particle size from 0.2 mm to 1 mm, dried to constant mass. The sand was modified by pre-treatment of a 1% solution of silane with subsequent drying.

Polymer-sand products were obtained in two ways. In the first case, a polymeric matrix and a filler were mixed in the cold state and subjected to heat treatment in a muffle furnace at 250 C for 15 minutes, then the resulting system was stirred in a blade mixer with heating and the samples were obtained by pressing. In the second case, the polymer matrix was pre-melted in an extruder and mixed with hot sand in a paddle mixer. The identified mechanical properties of the obtained specimen are density, Tensile strength at break, strength at compression, strength at flexure and thermal resistance, the MFI, the quality of mixing. The obtained data of mechanical properties is presented in the table.

Table -Mechanical properties of obtained polymer-sand compositions

№	The structure of composition		Tensile strength at break, σb, MPa	Strength at compression, σc, MPa	Strength at flexure,σf,MPa
	The content of polymer, %	The content of sand, %			
1	PE	80	15-25	25-30	17-25
2	R-PET	80	45-50	80-95	35-40
3	PETG	80	45-55	90-105	30-35
4	PETG/ PE-g-MA10/10	80	45-55	80-85	30-35
5	PETG/PC 15/5,0	80	55-65	115-120	65-70

The best physical-mechanical properties have the polymer compositions based on PETG and PETG with the addition of PC.

References: 1. A. Benazzouk, O. Douzane, T. Langlet, K. Mezreb, J. M. Roucoult and M. Quéneudec, "Physico-Mechanical Properties and Water Absorption of Cement Composite Containing Shredded Rubber Wastes," Cement and Concrete Composites, Vol. 29, No. 10, 2007, pp. 732-740.