

Resume of Dissertation:

Recycling of mixed wastes of polyethylene and polypropylene

Dr. Irena Todorova Borovanska
Institute of Mechanics
Department of Physico-Chemical Mechanics

Recycled polymers possess their own “Prehistory” which defines the possibility for reusing them for different applications. The industrial scrap has the so called thermo-mechanical prehistory due to the big shear forces and the high temperatures in the processing machines. Postconsumer polymer wastes, have also, apart from it, and the so called thermo-oxidative prehistory as a result of their exploitation conditions.

A big part of the continuously increasing portion of polymer waste in Bulgaria is constituted of polyethylene and polypropylene ones. Usually they are mixed in approximately equal quantity in the plastic waste stream and their difficult gravimetric separation leads to the necessity for conducting studies on how to obtain useful materials from their mixtures.

This dissertation is related to the recovery of mixed wastes of polyethylene and polypropylene by elastification and finding suitable applications of the obtained modified mixtures. Three groups of LDPE and PP materials are used (virgin materials, technology and postconsumer wastes) and two types of modifiers - NBR and EPDM in the percentage ratio of 7 to 15%.

In this thesis has made identification and qualitative assessment of randomly selected, and with unclear prehistory polymer wastes of polyethylene and polypropylene, obtained in Bulgaria. In this thesis has examined rheological, thermal and mechanical properties, structure and phase morphology, ageing (naturally and accelerated in camera), foaming macrostructure as well as sound absorption in chamber of thermoplastic blends of the different groups.

After a comparative analysis and evaluation of the results, a conception is proposed for producing of sandwich-like structure material with an external skin built of virgin polymer and a core of modified foamed polymer recyclates by the method of co-extrusion or two-component injection molding. Using the proposed technological scheme already are received encouraging initial experimental results for obtaining such product by the co-extrusion method.