CHEMICAL MODIFICATION AND RECYCLING OF POLYETHYLENE WASTES

Samir Guliyev, Gabil Sharifo, Ayaz Efendiev

Institute of Polymer Materials of Azerbaijan National Academy of Sciences, Sumgait

The recycling of polymers is one of the main directions of utilization of wastes forming both in the process of production and in reprocessing and after exploitation [1]. However, utilization of wastes is complicated because these materials are subjected to oxidation during processing and exploitation in various climatic conditions and changes in the structure of macromolecules take place which result in worsening of their properties. Therefore, the problem of modern recycling requires the new efficient methods of modification [2]. In this work polymer wastes are firstly subjected to mechanical-thermal reprocessing in rolls at 120-180°C in the presence of additives, favoring decrease of melt flow of secondary polyethylene and then chemical modification in extruder with the participation of sodium trichloroacetate at conditions of polyethylene processing. 2-mercaptobenzthiazol (MBT) has been proposed as an additive. The investigations showed that in the presence of 0,3-0,6% mass of MBT and with rise of processing temperature a decrease of content of gel-fraction is observed, which witnesses about destruction of three-dimensional structure and as a result a rise of melting index. Further chemical modification and subsequent granulation of polyethylene have been carried out in the extruder. It has been shown in this case that the process of modification occurs as a result of the addition reaction of dichlorocarbene, generated from sodium trichloroacetate with double bonds of secondary polyethylene and its implementation on methylene groups of the main chain, activated by the neighboring carbonyl groups.

Derivatographic analysis and TGA of initial and modified polyethylene showed that an addition of dichlorocarbene to double bonds as well as its implementation on methylene groups lead to reduction of activation energy of destruction.

References