POLYETHERIMIDES OF COPOLYMER STRUCTURE AND THEIR THERMAL PROPERTIES

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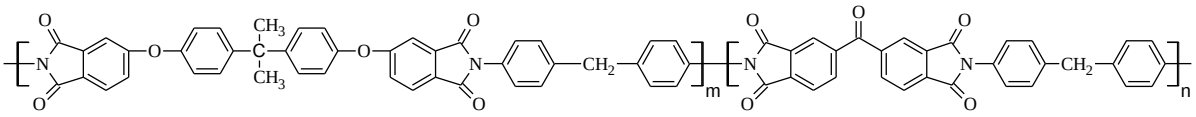
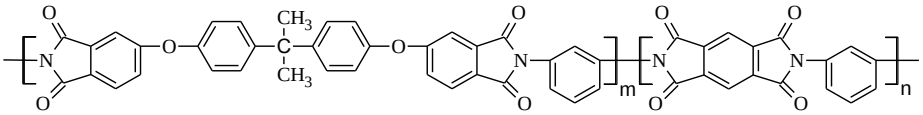
Polyetherimides (PEI) constitutes a subclass of polyimides that have increased solubility in organic solvents and the ability to be processed into products by injection molding and extrusion methods due to the high content of hinged ether bonds presented in the structure of their macromolecules [1]. Due to their high technological properties, heat and chemical resistance, PEIs are widely used in many areas of industry, such as aviation, automotive and medical, as well as in electronics, instrument making, 3D printing, etc. [2].

One of the ways to increase the heat resistance of PEIs and to expand their brand range is to introduce rigid-chain fragments into the composition of their macromolecules [3]. In the present work, PEIs of copolymer structure of the MAB line (**Scheme** 1) based on 4,4´-diaminodiphenylmethane, 4,4'-bisphenol A dianhydride (BPADA) and 3,3',4,4'-benzophenone tetracarboxylic dianhydride (BPDA) and of the FAP line (**Scheme** 2) based on 1,3-diaminobenzene, BPADA, and pyromellitic dianhydride (PMDA) were synthesized.



Scheme 1. Copolyetherimides of the MAB line.



Scheme 2. Copolyetherimides of the FAP line.

The synthesis of PEI was carried out using a two-stage procedure to obtain polyamide acid on the first step and its imidization on the second one. The completeness of the polyamide acid cyclization reaction was controlled by the method of Infrared Spectroscopy (IR). It was found using the methods of Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA) that the introduction of BPDA and PMDA in the amount of 10-30% mol. makes it possible to increase the glass transition temperature of copolyetherimides of the MAB and FAP series by 10-25°C as well as their thermal-oxidative resistance by 5-10°C. Furthermore, the synthesized PEIs retained the ability to be processed through the melt at temperatures of 350-370°C, which was shown by determining their melt flow index (MFI). Nonetheless, a further increase in the content of BPDA and PMDA fragments in the copolymers structure resulted in the creation of a crystalline phase with a melting point of 370-400°C, leading to the loss of solubility of PEIs, a decline in their melt flow index and, ultimately, to the impossibility of processing through the melt.

References

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Acknowledgements

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