

„Manufacturing of composites with natural fibres"

Laboratory exercise

I. Exercise objectives:

theoretical: to acquire basic information about producing and practical use of polymeric composites filled by lignocellulosic materials,

practical: manufacturing of polypropylene composites with renewable materials using extrusion technique.

II. Theoretical issues: thermoplastic polymers, composites, extrusion of polymers, biodegradable fillers, renewable materials.

III. Equipment: single-screw extruder, tank for cooling plastics, granulator.

IV. Materials:

- Isotactic Polypropylene PP Moplen HP 500J - Bassel Orlen Polyolefins or another polypropylene, (granulate);
- Lignocellulosic material (in size reduced form, native or chemically modified) from wood, natural fibres: wood, hemp, flax, sisal, rapeseed straw or energetic plants (e. g. Virginia mallow). To produce the composites we used 1 – 2 mm fraction.

V. Literature

- D. Paukszta & J. Garbarczyk – “Recycling of polymers – the programme for the course of environmental protection”, Journal of Materials Education, The Materials Education Council PA, USA, vol. 21 (5&6), p. 277, 2001.
- J. Gassan, A. K. Błędzki - "Possibilities to improve the properties of natural fiber reinforced plastics by fiber modification - jute polypropylene composites", Applied Composite Materials &, 373-385, 2000.

- A. Klyosow – „Wood Plastic Composites”, John Wiley & Sons, New Jersey, 2007.
- S. Borysiak, D. Paukzta – “Mechanical properties of lignocellulosic/Polypropylene composites”, Mol. Cryst. Liq. Cryst., vol 484, p. 1379, 2008.
- D. Paukzta, S Borysiak – “The influence of processing and polymorphism of lignocellulosic fillers on the structure and properties of composite materials – a review”, Materials, 2013, Vol. 6, 2747-2767

VI. Experimental part:

The composites with lignocellulosic materials will be obtained by extrusion method using a “Fairex” (Mc Nell Akron Repiquetn, France) single-screw extruder with a length-to-diameter ratio L/D of 25 and screw diameter 25 mm. The composite material will be contain 20 – 40% of the lignocellulosic materials.

Extruding process parameters are as follow:

I zone – 140 °C, II zone – 185 °C, III zone – 195 °C, head – 200 °C.