Abstract

This dissertation is concerned with the study of the mechanical and structural properties of elements produced by 3D printing from polylactide. The research focused on the analysis of the influence of the production temperature on the performance characteristics of the products. Particular attention was paid to structural studies in the nano- and micro-scale. This required the use of advanced research methods based on: Near interaction microscopy, contact profilometry and X-ray diffraction. Susceptibility to elastic deformation was determined based on: static tensile tests, ultrasonic methods and impulse excitation technique. The use of several investigation methods was necessary due to the anisotropic properties of the products manufactured using 3D printing technology (Fused Deposition Modelling, FDM). In addition, due to the possibility of the material being in crystalline or amorphous form, tests of the internal structure were also carried out using spectroscopic and calorimetric methods. The rheological properties were tested and an algorithm for the manufacturing process in 3D printing technology was created. In the investigation of SGP and structural polymers, attempts were made to apply the allometric scaling technique and the modified Scherrer method, respectively. The results obtained with these methods and their combination could set a new trend in the study of the structure of polymers, because the author is not aware of any work of a similar nature.