

## ABSTRACT

**Title:** Research and analysis of cylindrical machine elements produced by hybrid methods of rapid prototyping

The subject of the dissertation discusses the problem of production machine parts from polymeric materials made by material extrusion and the limitations of this technology related to the arrangement of the model in the working chamber of the device. The main purpose of the work is to develop a methodology for manufacturing machine parts operating in the range of torsional loads, with a given strength, using the developed hybrid manufacturing technology combining the method of material extrusion with casting under reduced pressure.

The first part of the work includes an analysis of the state of affairs related to the production of machine parts made of polymeric materials and polymer-metal elements using hybrid technologies using additive methods. The limitations that result from the use of the material extrusion method, and in particular the mechanical anisotropy, justify the topic of the doctoral dissertation.

In the second part of the dissertation, the methodology of hybrid manufacturing of machine parts was developed. Test samples were made by material extrusion, low pressure casting technology and the developed hybrid technology. ABS and PLA thermoplastics and vacuum-cast PR2000, PR700, PR1819 chemically cured resins were used to produce the samples. Then, strength tests were performed in the form of a static tensile and bending test of standard samples and a static torsion test of cylindrical splined samples on a designed test stand. Tests of geometric accuracy and geometric structure of the surface of the samples were carried out. The last part of the research was thermal measurements using differential scanning calorimetry. Based on the analysis of the obtained research results, conclusions were formulated.