

Composites produced by 3D printing and electrospinning technologies in filter applications

Tomasz Koziar

Kielce University of Technology, Faculty of Mechatronics and Mechanical Engineering, Department of Manufacturing Technology and Metrology

E-mail: tkoziar@tu.kielce.pl

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Abstract The development of modern manufacturing technologies, largely related to the industrial revolution 4.0, which is at an advanced stage, makes unconventional manufacturing technologies such as 3D printing and electrospinning find more and more practical applications. The undoubted advantage of these technologies is the fact that they can be combined, which means that we are able to produce models with very interesting practical properties and potential use in the medical, chemical, textile, mechanical, food, etc. industries. Composite models created in this way thanks to the development of the chemistry of materials, mainly biocompatible through the appropriate 3D printing control process and electrospinning technology parameters, allow the creation of composites with filtration properties. The presented research results concern composite models manufactured by 3D printing samples in FDM (Fused Deposition Modeling) technology from PLA material and PJM technology (photo-curing of liquid polymer resins) and MED610 material with high potential for use in the medical and dental industry. These models were subjected to the electrospinning process - ES (polyacrylonitrile (PAN) based material) in order to make models with filtration properties. The models made in this way were subjected to a series of tests in order to assess their properties using: Confocal Laser Scanning Microscopy (CLSM), Contact Angle Measurements, and Chemical Composition analysis using Fourier Transform Infrared Spectroscopy (FTIR). This approach to creating composites appears to be an alternative to developing research for filtration applications. By analyzing the presented tests results, the quality of the produced composites and the influence of the process parameters were assessed.

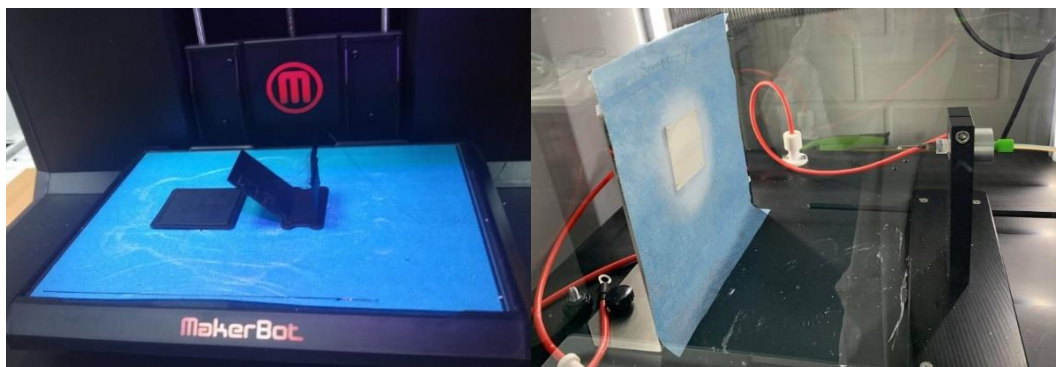


Figure 1. Research models: a) on printer, b) on ES machine