Research of continuous carbon fibre content in porous composite structures produced by using additive manufacturing technology

Nabeel Maqsood[1,*], Marius Rimašauskas[1]
[1]*Kaunas University of Technology, Department of Production Engineering, Faculty of Mechanical Engineering and Design 51424 Kaunas, Lithuania, nabeel.maqsood@ktu.edu*

Keywords. additive manufacturing, continuous carbon fibre, porous composite structures, dissolution

Abstract.
Additive manufacturing (AM) is a process of fabricating 3D parts layer upon layer until the final product is manufactured. This technology is employed in the engineering applications mainly in aerospace, automobile, medical implants and textile, etc. In nowadays, most of the composite parts are fabricated using AM technologies due easy production process, relatively high accuracy of produced parts, less material wastage, huge range for material selection and economic factors. During the production of composite materials, reinforcement content plays an important role in defining the strength, stiffness and other properties of the composite structure. In this study, porous continuous carbon fibre reinforced polymer composite (CCFRPC) structures were fabricated using fused deposition modelling (FDM) extrusion based technology. Porous CCFRPC structures were additively manufactured using two types of infill patterns (grid and triangular) printed at three different infill densities level (20%, 40% and 60%). After the fabrication process, the content of continuous carbon fibre (CCF) in the composite were calculated and estimated using dissolution method. For the dissolution ASTM D 3171 standard procedure was used in order to define carbon fibre content in porous structures. The results show that grid infill pattern contains more reinforcement content (CCF) compared to triangular infill pattern. Moreover, higher reinforcement content in the structure was observed when infill density of the specimen is increasing.