

Research of impregnated carbon fiber tow quality for 3D composites printing

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Abstract.

Today time is becoming more and more important in our life. Well planned time can save our money, inventories, human resources, however small planning errors can cause extreme losses, especially in manufacturing sector. Today computerization, automatization, robotization and deeper communication lead us to fourth industrial revolution while additive manufacturing technologies standing in front of Industry 4.0. These technologies were developed for production of prototypes from polymeric materials, however today metals, composites, ceramics materials can be used too. This article focusing on quite new concept of fused deposition modelling (FDM) technology – composite structures printing with continuous carbon fiber (CCF) as reinforcement material. This process uses standard polymeric material polylactic acid (PLA) as matrix material and impregnated 1 K carbon fiber tow. In the article quality of impregnated carbon fiber tow was evaluated by performing tests: microstructural analysis, adhesion force determination between impregnated CCF and matrix, visual analysis of impregnated fiber cross-section and thermal analysis. Experimental results allow to understand how impregnation process influence on quality of 3D printed composite structures and formation of air voids. Defined impregnation process parameters will help increase adhesion force between matrix and continuous carbon fiber and improve mechanical properties of structures.