Experimental and Numerical Investigations of Mechanical Properties of 3D-Printed Polymeric Samples with Ideal and Roughed Surfaces

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Abstract. The mechanical properties of the polymeric samples were discussed in many papers. Only several of them investigates the mechanical properties of the 3D-printed sampled prepared by different technologies, i.e. FDM, FFF, MJM, SLA, SLS etc. More dense samples could be obtained by any art of SLA technology, for example, based on the DLP principles, whereby less dense samples made of any thermoplastic materials obtained by FFF technology. In the current paper the authors carried out, firstly, experiments and numerical simulation of the tensile and compression tests of the 3D-printed samples made of ABS, PA12 with short carbon fibers, PETG and light sensitive polymer. The density of the material was taken as a goal function. The initial CAD-model does not contained any topological information to the samples' surface. Secondly, the same simulation runs but for CAD-model obtained by 3D-scanning were performed with respect to the surface appearance. And, thirdly, at the end the experimental and numerical results were compared. The deviation of the flow stress between the numerical results for ideal and roughed surfaces were arranged within the 5 – 10%. The experimental results had shown the differences of up to 10% depends on the material and art of mechanical test.