Fused Deposition Modelling: New Standards for mechanical characterization

C. Tosto [1,*], L. Saitta[1], E. Pergolizzi[1], A. Patti[1], G. Celano[1],G. Cicala[1,2]
[1]University of Catania, DICAR, Viale Andrea Doria 6, 95125 Catania (Italy)
[2]UdR-CT INSTM DICAR, Viale Andrea Doria 6, 95125 Catania (Italy)

Keywords. (Fused Deposition Modelling, Design of Experiments, Mechanical Properties)

Abstract.
Fused Deposition Modelling is the preferred additive manufacturing techniques for load bearing applications. Many examples of parts manufactured by FDM can be seen in the aerospace and automotive fields. However, the parts printed by FDM are peculiar because they are mostly anisotropic and with voids [1]. Therefore, traditional standards developed for bulky thermoplastic specimens manufactured by injection molding or compression molding is increasingly seen as inadequate [2]. In this paper, design of experiments (DoE) techniques are used to analyze different testing procedures to develop new standards for the mechanical characterization of FDM printed parts [3].
Different printing parameters were modified varying the loading mode from tensile to flexural or shear test. Different materials from Polycarbonate to Polyetherimide were also used to account for the different printing quality. As the result of this study some useful indications for further development of the standard procedure for testing were drawn.

References
[1] Cuan-Urquizo, E.; Barocio, E.; Tejada-Ortigoza, V.; Pipes, R.B.; Rodriguez, C.A.; Roman-Flores, A. Characterization of the Mechanical Properties of FFF Structures and Materials: A Review on the Experimental, Computational and Theoretical Approaches. *Materials* **2019**, *12*, 895.
[2] García-Domínguez, A.; Claver, J.; Camacho, A.M.; Sebastián, M.A. Considerations on the Applicability of Test Methods for Mechanical Characterization of Materials Manufactured by FDM. *Materials* **2020**, 13, 28.
[3] Tosto, C.; Saitta, L.; Pergolizzi, E.; Blanco, I.; Celano, G.; Cicala, G. Methods for the Characterization of Polyetherimide Based Materials Processed by Fused Deposition Modelling. *Appl. Sci.* **2020**, 10, 3195.