European Journal of
Applied Engineering and Scientific Research

Abstract

Low reaction-to-fire polymer filament : formulation, 3D printability modeling and fire testing

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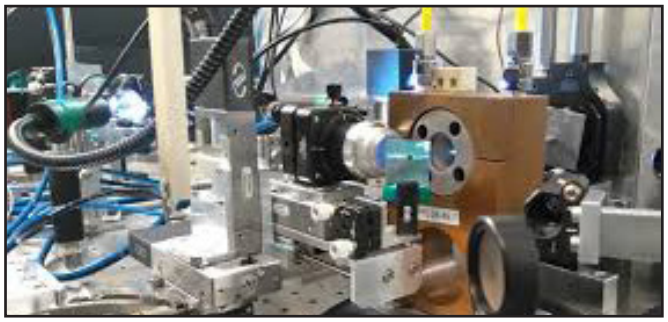
Abstract:

Additive manufacturing and especially Fused Filament Fabrication (FFF) technology is mature enough for industrialisation. Indeed, many works about new composite filaments for 3D-printing and3D-printability are reported1, 2.However most of them only focus on one specific aspect such as temperature changes3, bond formation4 or rheology5instead of performing a systemic approach. In addition to this, fewpapersdeal with 3D printing and fire properties6. The objective of this studyis to develop new filament for FDM/FFF with low reaction to fire in order to fulfil the rail and aeronautic fire requirements. First, the development of a proper definition of 3D-printability and of a mathematical model to determine this 3D-printability was investigated. All the parameters influencing the 3D-printability were determined and the Buckingham theory was applied to determine the dimensionless numbers influencing this 3D-printability. The impact of the 3D-printing parameters on the fire performances was then evaluated via UL94 (standardized vertical flame propagation) and cone calorimeter (heat release rate under radiative heat flux) tests. Finally, formulations were developed in order to satisfy all requirements in rail and aeronautic industry.

Biography:

Thomas NAZÉ got his engineering degree in chemical science from ENSCL and his master's degree in formulation science in Lille in 2018 and is currently doing his PhD in Centrale Lille Institute, in the Material and Transformation Unit (UMET) Lille in collaboration with CREPIM company (www.crepim.fr).



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3rd International Conference on 3D Printing and Additive manufacturing; May 22-23, 2020; Paris, France

Citation: Thomas NAZE, Low reaction-to-fire polymer filament : formulation, 3D printability modeling and fire testing; May 22-23, 2020; Paris, France