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Short Communication

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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 and 3D-printability are reported. However most of them only focus on one specific aspect such as temperature changes, bond formation or rheology instead of performing a systemic approach. In addition to this, few papers deal with 3D printing and fire properties.

The objective of this study is 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).

Publication of speakers

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