allied academies

2nd International Conference on

Materials Science and Engineering

February 25-26, 2019 | Paris, France

Guessasma S

INRA, France

Printability of polymers in additive manufacturing: The example of copolyester

The printability conditions of copolyester are investigated using different instrumental techniques such as infra-red camera observations, Differential Scanning Calorimetry, Scanning Electron Microscopy, X-ray micro-tomography, and mechanical testing. The Fused Deposition Modelling (FDM) technique is used to fabricate various types of specimens for the purpose of assessing both the thermal and mechanical properties of copolyester. The optimal conditions for 3D printing of copolyester are determined based on the influence of dimensional scaling, printing temperature, and type of layups. Thermal behavior is determined by looking at the thermal cycling on both prints and rafts as a function of the process conditions. Tensile properties are measured for both the raw and printed copolyester and the loss in mechanical performance including stiffness, plasticity and failure is quantified with respect to the printing temperature. In addition, the microstructural arrangement is investigated using X-ray micro-tomography to reveal the nature, the extent, and the 3D arrangement of defects. Analysis of ruptured samples is performed using SEM analysis. The results reveal a significant non-linear effect of the printing temperature on the performance of copolyester. A complex microstructural arrangement of defects is revealed including a regular network of porous structure. The failure of printed copolyester is explained through SEM analysis by the combination of three different damage mechanisms. These results suggest a strong correlation between the observed thermal cycling and the mechanical performance of copolyester.

Speaker Biography

Guessasma S is a mechanical engineering scientist, a by-fellow of the Churchill College, University of Cambridge, UK. He is presently a senior scientist at INRA (France) conducting a research activity in the field of additive manufacturing of biosourced materials. He has a key interest on hot topics in mechanical engineering, processing and materials science. He has several contributions related to the microstructural interpretation of material performance, mechanical modelling, image analysis, and in-situ experiments. He has published over 100 papers in different research fields.

e: sofiane.guessasma@inra.fr

Notes: