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GEL AIDED VISCOELASTIC BIOMATERIAL 3D PRINTING

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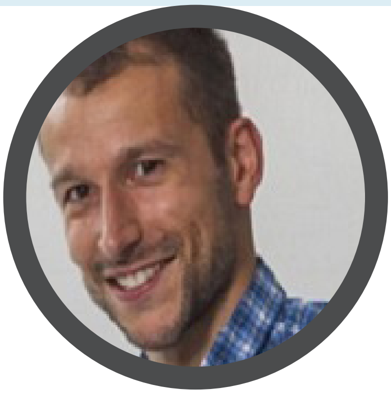

3D printing of viscoelastic materials with poor rheological properties is impossible in atmospheric conditions. Indeed, a significant yield stress character of the material is required to maintain the shape of the 3D object after deposition. This character might be achieved through material re-formulation but in the case of particular application such as biomedical implants, modification of rheological properties through change in material composition is excluded and alternative solutions must be found. The use of supporting gel systems can be proposed as an elegant solution to maintain the 3D object shape during printing and solidification. Nevertheless, the supporting gel systems are not perfect and some problems rise such as material bearing, poor layer cohesion and low gel self-healing. Rheological characterizations focused on hardness, yield stress and thixotropy measurements are then the best way to understand and predict the performance of the system. Thus, for each printing material intrinsic properties and solidification conditions, an adequate gel formulation must be defined to successfully obtain 3D printed objects. Hence, we propose an overview of this technique through different applications using a multi-state and muti-scale approach based on the correlation between rheological characterization and 3D printing observation. Our studies also come up with the use of biomaterial including living cells in supporting gel systems. In this case, the gel must have an additional function to assist cells maturation. Clear experimental results will be presented together with different cases studies of highly challenging 3D printing, demonstrating the superiority of the approach.

Biography

Edwin Joffrey Courtial has completed his PhD from IMP (Ingénierie des Matériaux Polymères) lab, Claude Bernard University of Lyon 1. He is working as a Researcher specialized in Materials Science and Rheological Behaviors at ICBMS lab, Lyon, France, inside the innovative platform 3D.FAB. His research focuses on correlation between biomaterials formulations and rheological behaviors to define 3D bioprintable conditions.

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