Joint Event on
9th International Conference on
Big Data Analysis and Data Mining
7th International Conference on
3D Printing Technology and Innovations

August 03, 2022

WEBINAR

Aida Naseri et al., J Comput Sci Syst Biol 2022, Volume 15

Novel Cryogenic approach to 3D printing aqueous-based inks

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3D printing and additive manufacturing has found a wide range of biological applications in particular tissue engineering and regeneration. One of the main aims of this field is to design scaffolds that mimic the 3D environment of the targeted tissue it aims to substitute to act as a temporary extracellular matrix to support cell growth and survival. Hydrogels, due to their high water content, porosity, and tissue like properties, are considered as great starting materials and may be combined with other materials to improve their electrical, mechanical, or anti-bacterial properties.It is well known that extrusion 3D printing is considered as an efficient way to fabricate multi-layer, complex, 3D scaffolds with high precision. One key requirement, in order to obtain layer-by-layer structures with high precision, is the solidification of the extruded material following deposition. Most researchers in the field of tissue engineering focus on materials which are compatible with existing, commercially available, 3D printers and solidification methods. None of these methods are, however, suitable for hydrogels containing high loadings of conductive components. Development of a low-cost subzero printer not only allows the exploration of higher range of biomaterials for tissue regeneration of excitable tissues in particular heart and nerve, but also opens the field up to a larger number of researchers. This would get us closer to the translation of laboratory research into clinical trials.

The designed novel 3D printing setup provides a rapid solidification of the extruded material following deposition which results in layer-by-layer structures with high precision.

1.The designed novel 3D printing setup provides a rapid solidification of the extruded material following deposition which results in layer-by-layer structures with high precision.

Biography

Aida Naseri has received her MSc in polymer engineering in 2013 from Tehran Polytechnic (AUT), Iran. She is currently a last year PhD scholar at Intelligent Polymer Research Institute (IPRI), university of Wollongong under the supervision of Prof. Gordon Wallace. Her research interests include 3D printing, conductive materials, and tissue engineering. Her current research is focused on cryogenic 3D printing and development of novel aqueous based 3D printable conductive inks for nerve tissue regeneration.

Received: March 07, 2022; **Accepted**: March 09, 2022; **Published**: August 03, 2022