Lead Speakers
Min Wang, The University of Hong Kong
Rena Bizios, University Of Texas, San Antonio, USA
Yasuhiko Tabata, Kyoto University, Japan
Surya Mallapragada, Iowa State University, USA
Animesh Jha, University of Leeds, UK
Sourabh Ghosh, Indian Institute of Technology, Delhi, India
Invited Speakers
Alain Largeteau, The Institute for Solid State Chemistry Bordeaux , France
Atsushi Suzuki, University of Yokohama, Japan
Kaustabh Kumar Maiti Council and Scientific and Industrial Research of India, Thiruvananthapuram

Silk protein-based bioprinting strategies to develop custom-made engineered construct

Dr Sourabh Ghosh
Department of Textile Technology, IIT Delhi, India

Tissue engineering strategies fail to develop patient-specific, damage-site specific engineered constructs. Bioprinting offers fascinating prospects for printing three-dimensional tissue constructs by delivering living cells with appropriate matrix materials. However, progress in this field is currently extremely slow due to limited choices of bioink for cell encapsulation and cytocompatible gelation mechanisms.

Rheology of silk protein solutions do not fulfill requirements of printing by inkjet printer or Direct-write technique. Shear force developed during printing transforms random coil conformation of silk polymers to beta-sheet crystallized conformation, resulting in frequent choking of nozzles.

We developed a novel bioink, by mixing silk and gelatin in different ratios, to develop complex micro-periodic architectures. Further clinically relevant sized tissue analogs have been developed by delivering human nasal inferior turbinate tissue-derived mesenchymal progenitor cells encapsulated in silk fibroin–gelatin bioink. Gelation in this bioink was induced via *in situ* cytocompatible gelation mechanisms, namely enzymatic crosslinking by mushroom tyrosinase and physical crosslinking via sonication. The effect of optimized rheology, secondary conformations of silk–gelatin bioink, temporally controllable gelation strategies and printing parameters were assessed to achieve maximum cell viability and multilineage differentiation of the encapsulated human nasal inferior turbinate tissue-derived mesenchymal progenitor cells. This strategy offers a unique path forward in the direction of direct printing of spatially customized anatomical architecture in a patient-specific manner.