Abstract Submitted
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Using droplet-on-demand based printing to guide self-assembly in a peptide-protein based bioink[1] CLARA HEDEGAARD, ESTELLE COLLIN, CARLOS REDONDO-GOMEZ, Queen Mary University of London, LUONG T. H. NGUYEN, KEE WOEI NG, Nanyang Technological University, ALFONSO A. CASTREJON-PITA, University of Oxford, J. RAFAEL CASTREJON-PITA, ALVARO MATA, Queen Mary University of London — Tissue engineering aims to capture details of the extracellular matrix (ECM) that stimulate tissue regeneration. Advanced biofabrication techniques have enabled structural complexity, however they are restricted by the choice of material due to stringent printing requirements, leading to a lack of nanoscale control and molecular versatility. In this project, we exploit the dynamics of droplet fluid interactions combined with the co-assembly of peptide amphiphiles (PAs) with biomolecules/proteins to develop a new approach to droplet-based biofabrication. A custom-made droplet generator was developed and used to controllably dispense droplets of PA into a protein solution resulting in gel formation within milliseconds. Taking advantage of the interfacial and inertial forces during the droplet/liquid interaction, it is possible to control the co-assembly kinetics, to give rise to aligned or disordered nanofibers, hydrogel structures of different geometries and sizes, surface topographies, and higher-ordered structures made from multiple hydrogels. The process allows multiple cell types to be spatially distributed on the outside or embedded within the ECM mimetic scaffolds, whilst exhibiting high cell viability (> 88 %).

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