Project Name: MESO-BRAIN
Grant Agreement No: 713140
H2020 – FET Open Research Project

Deliverable 1.2 – 2PP Polymer Matrix Design (Summary)

Two-photon polymerization (2PP) is one of the most popular laser microfabrication methods and has grown rapidly in the last decade. It allows the fabrication of any desired complex computer-designed 3D micro- and nanostructure by direct laser writing within the volume of a photosensitive material. The fabrication process is based on nonlinear two-photon absorption of tightly focused femtosecond laser pulses inducing a highly localized photochemical reaction within the focal region of the applied laser beam, which leads to polymerization of the photosensitive material. By moving the beam focus in a 3D manner through the biomaterial, any desired polymeric 3D structures can be fabricated.

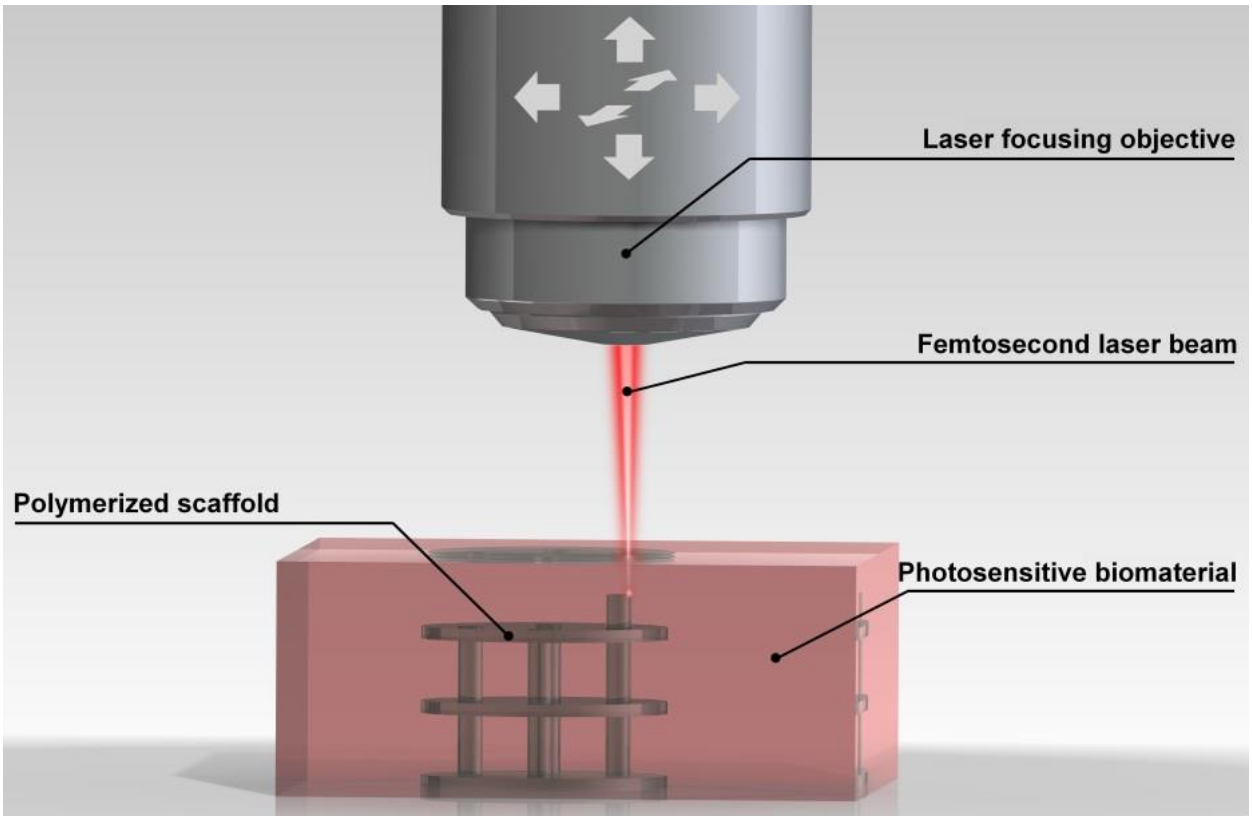

Figure 1 *2PP-Process: a femtosecond laser beam is tightly focused into a volume of a photosensitive biomaterial to initiate a highly localized polymerization process within the focal region by two photon absorption. By moving of the laser focus in a three-dimensional manner, any desired 3D scaffold can be fabricated*

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In comparison to other 3D prototyping techniques such as UV laser stereo-lithography, 3D inkjet printing, or laser sintering, it provides feature sizes down to sub 100 nm and a fully 3D capability, which opens a wide range of applications in the field of nanotechnology.

In the MESO-BRAIN project very sophisticated network scaffolds are required, which can be only fabricated by Two-photon polymerization.

The aim of this Task is to identify suitable biomaterials for the desired network scaffolds and to fabricate and to improve the design of the 2D and 3D scaffolds iteratively per the request of the consortium.

For the initial cell tests, different scaffolds have been fabricated by this key technology from the first identified materials. Per the first results of this biocompatibility Tests, additional scaffolds with different surface architecture were fabricated to investigate the suitability for long term culture.

The next step of this task is dedicated to the ability to guide and control cells in long term culture. Therefore, different surface pattern will be fabricated and studied to determine the best surface pattern and surface parameters for guiding and controlling cells.