Non-Destructive Mechanical Testing of 3D Scaffolds Printed into ElastoSens™ Bio Sample Holders

This work has been done in collaboration with Prof. Matt Kinsella and his team from McGill University

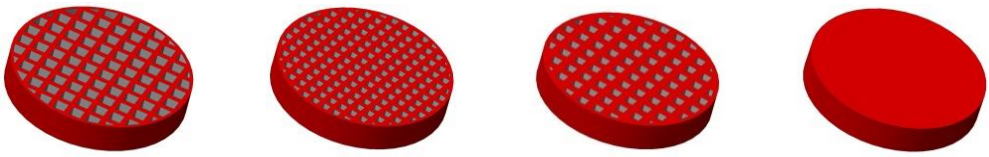
3D Printing into ElastoSens™ Bio Sample holder

3D printing of soft biomaterials is a promising technique in tissue engineering and for producing 3D cell culture constructs. There are many potential applications for measuring stiffness of 3D printed scaffolds, for example, verifying whether the stiffness of the 3D printed construct mimics stiffness of extra-cellular matrix for various different tissues. In this context, the non-destructive mechanical testing of 3D scaffolds is a key element to tune the printing pattern of hydrogel construct in a controlled environment and mechanically monitor evolution of cell growth and proliferation in the cell laden construct. One important first step in achieving this is to test the effect of printing patterns on the mechanical properties of the 3D printed structure.

Material & Method

ElastoSens™ Bio was used to measure the mechanical properties of 3D printed silicone. The silicone used was RTV silicone rubber from Dow Corning with a density of 1.02. 3D printed scaffolds with various volume fractions were compared to mechanical properties of the bulk RTV silicone rubber. 3D silicone scaffolds were directly printed into the ElastoSens™ Bio sample holders. The height and diameter of each sample was 3.0 mm and 22.1 mm, respectively. The voids of all printed scaffolds were filled with water using a vacuum chamber to ensure a stable and comparable density of 1.00 for all samples.

3D PRINTING PATTERN HAS AN IMPORTANT AND SIGNIFICANT IMPACT ON THE MECHANICAL PROPERTIES OF THE 3D CONSTRUCT



Silicone Volume Fraction	54%	68%	75%	100% (Bulk)
Printed Line Width	0.50 mm	0.50 mm	0.80 mm	-
Void Maximum Width	1.16 mm	0.69 mm	0.89 mm	-
Number of Tested Samples	4	4	4	4