# MSE-8: Structure and Property of 3D Printed Polymers

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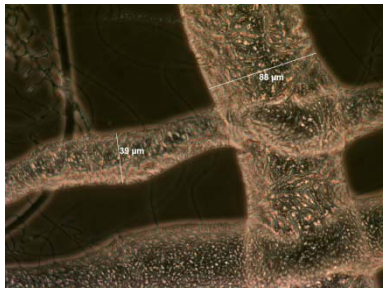
## Problem Statement:

How to synthesize aligned woven-like scaffold structures with sub-micrometer diameter fibers through 3D printing?

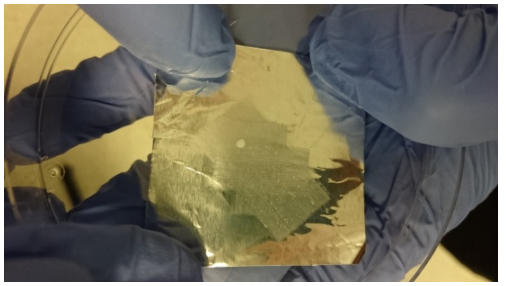
## Approach:

- Integrated 3D printing system and electrospinning system in order to print sub-micrometer fibers.
- Adjusted parameters of the system such as feed rate, material viscosity, voltage and collector distance for structural control.
- "Shish-Kebab" treatment for high biocompatibility.
- Characterized samples using SEM, DSC and XRD.

## Results:




**Scaffold structure under microscope**



**Aligned scaffold structure**

- SEM: integrity of structure/surface morphology.
- DSC: % crystallinity.
- XRD: polymer chain/crystallite orientation.
- "Shish Kebab" treatment – cellular microenvironment simulation.

## Discussion & Conclusions:

- 3D printing and solution electrospinning system were successfully integrated based on "direct writing".
- Melt electrospinning could not be applied for the project due to mechanical limitations and the high viscosity of the polymer melt.
- Minimum diameter of fiber produced was ~4 µm.
- Woven-like micro-scale scaffolds were successfully achieved.

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