SHENKAR

ENGINEERING. DESIGN. ART.

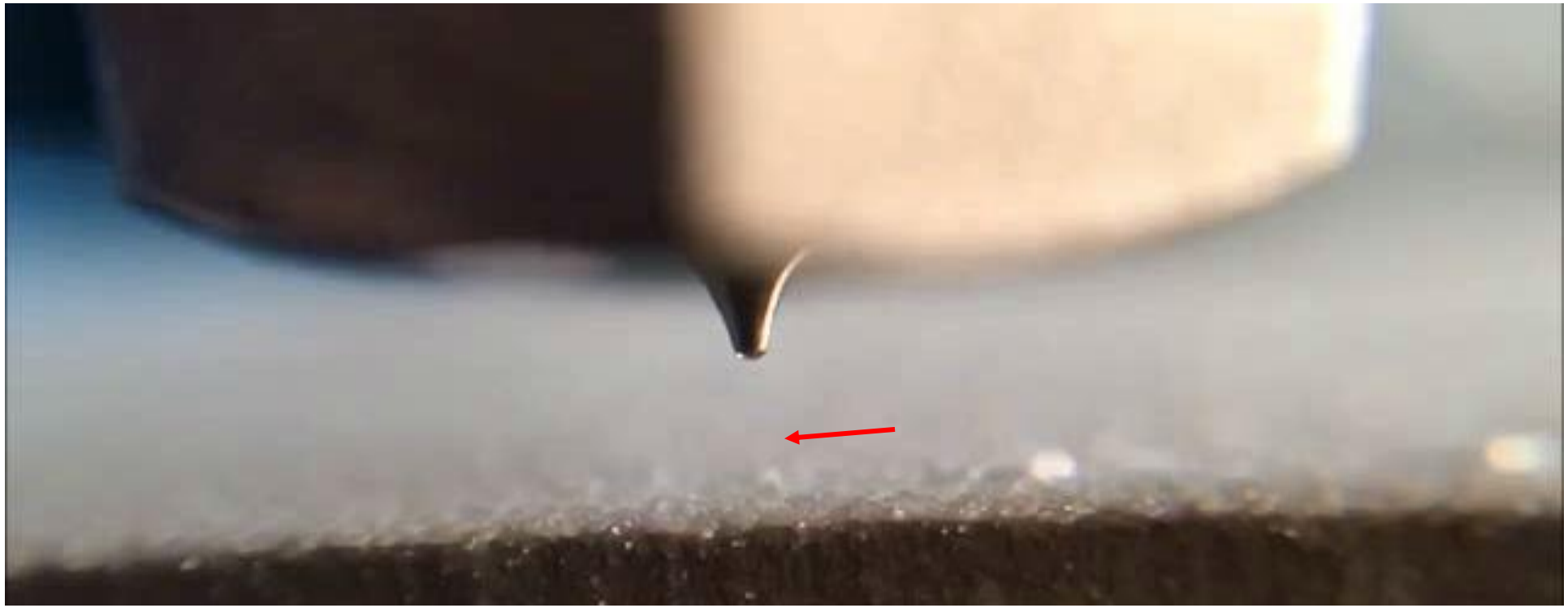
Plastics and Polymer Engineering department

Dr. Dan Lewitus

Two bioprinting-relevant technologies

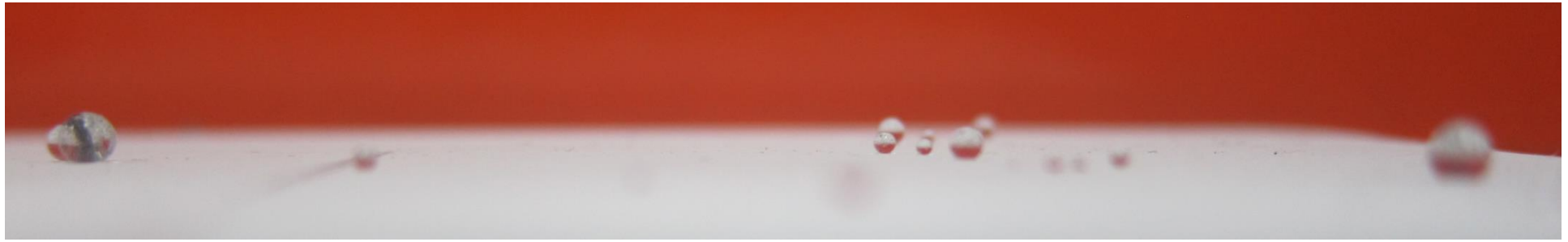
1. Printing of Cell-Laden Microspheres
2. Double-indirect printing of tissue engineering scaffolds.

Printing of Cell-Laden and Drug-Delivery Microspheres



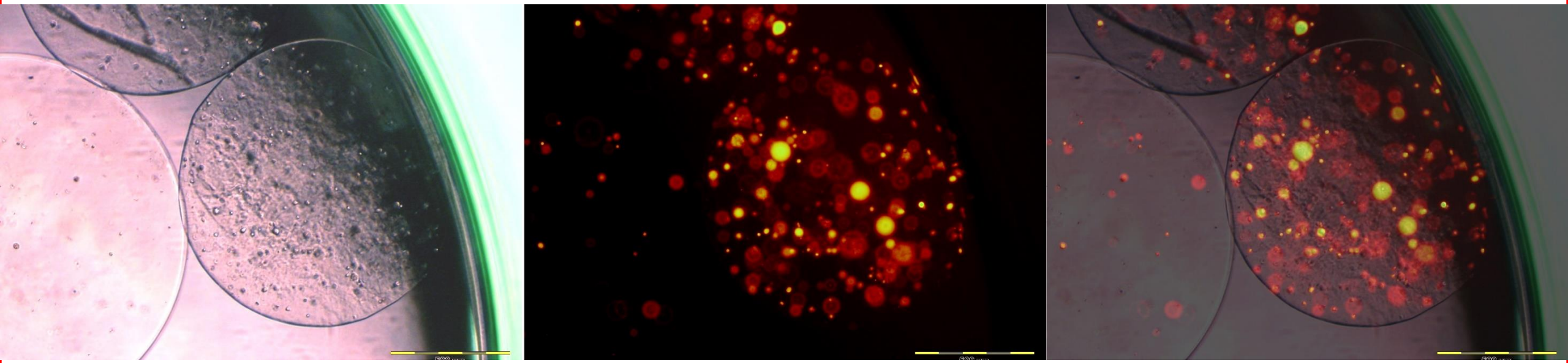
Shpigel et al., Eur J Pharm Biopharm. 2018

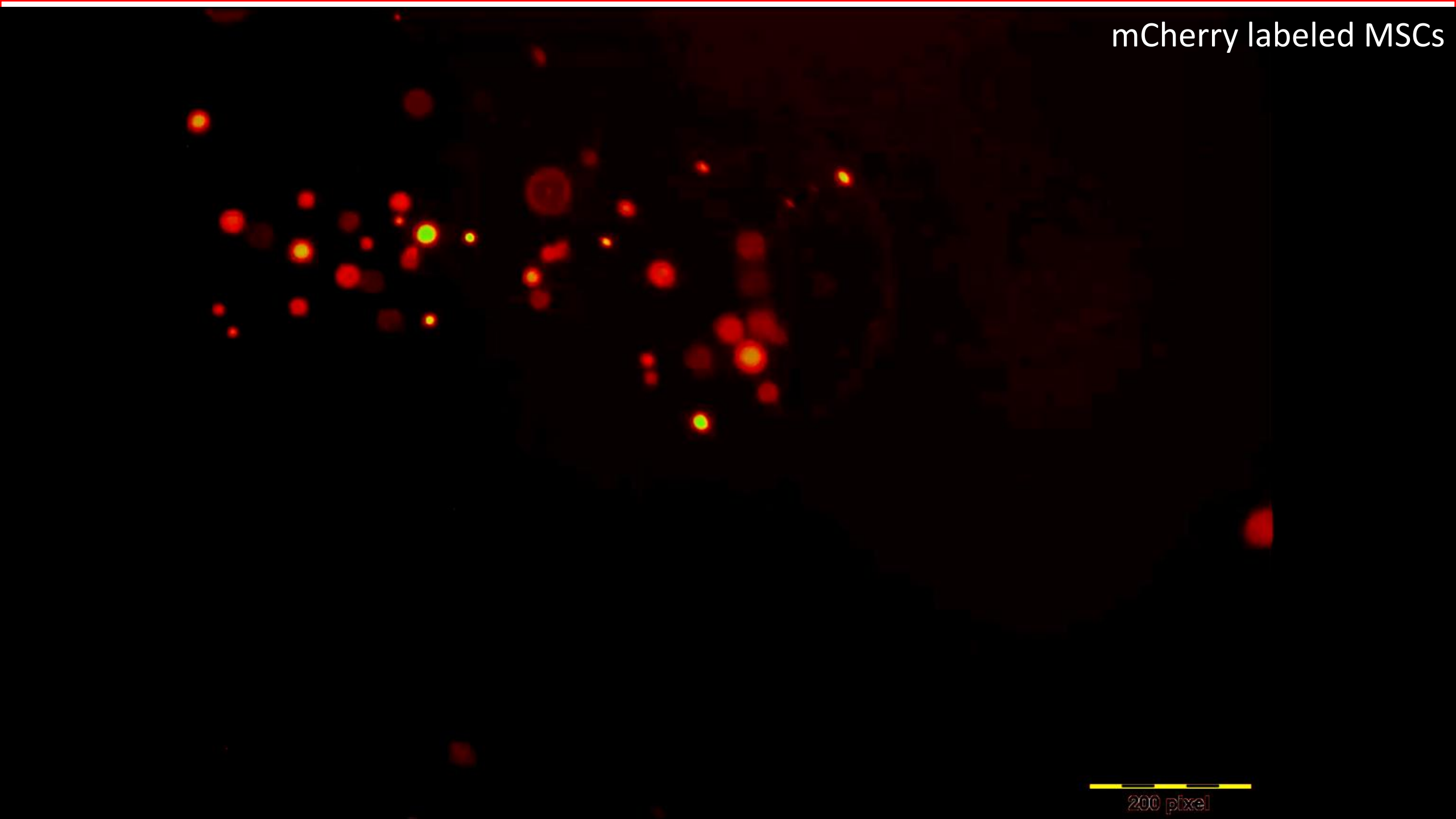
Printing cell-laden hydrogel microspheres



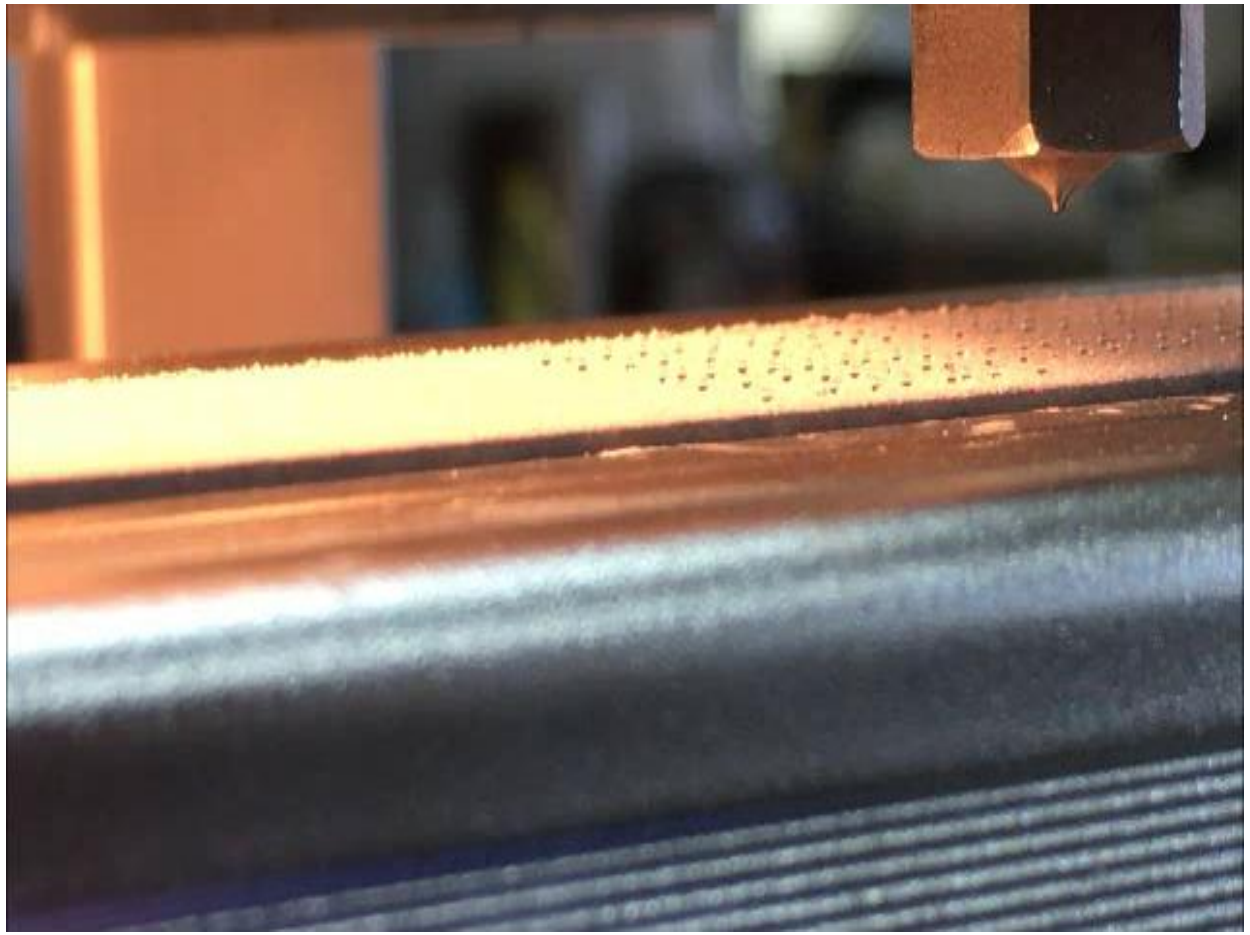
Printing cell-laden hydrogel microspheres

mCherry labeled MSCs

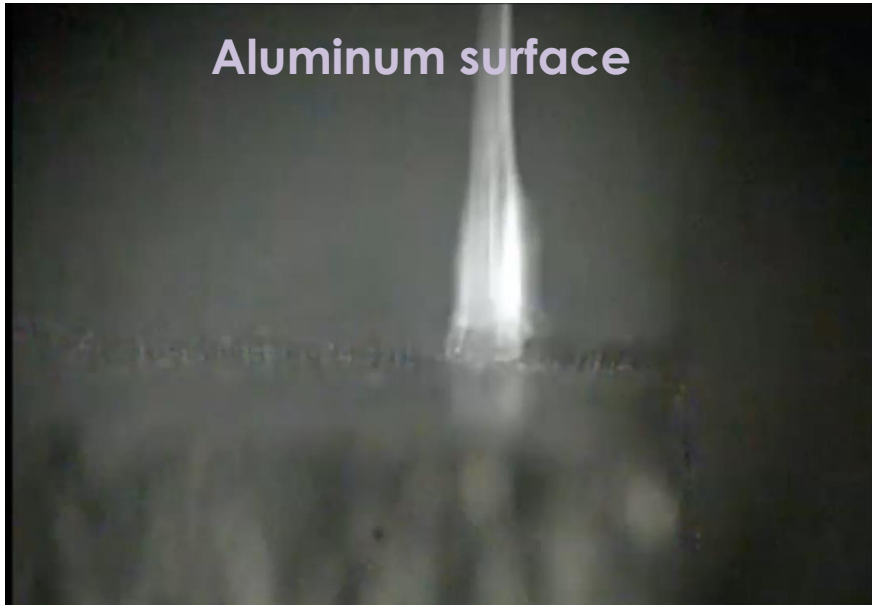



mCherry labeled MSCs
200 pixel

“Mass production”

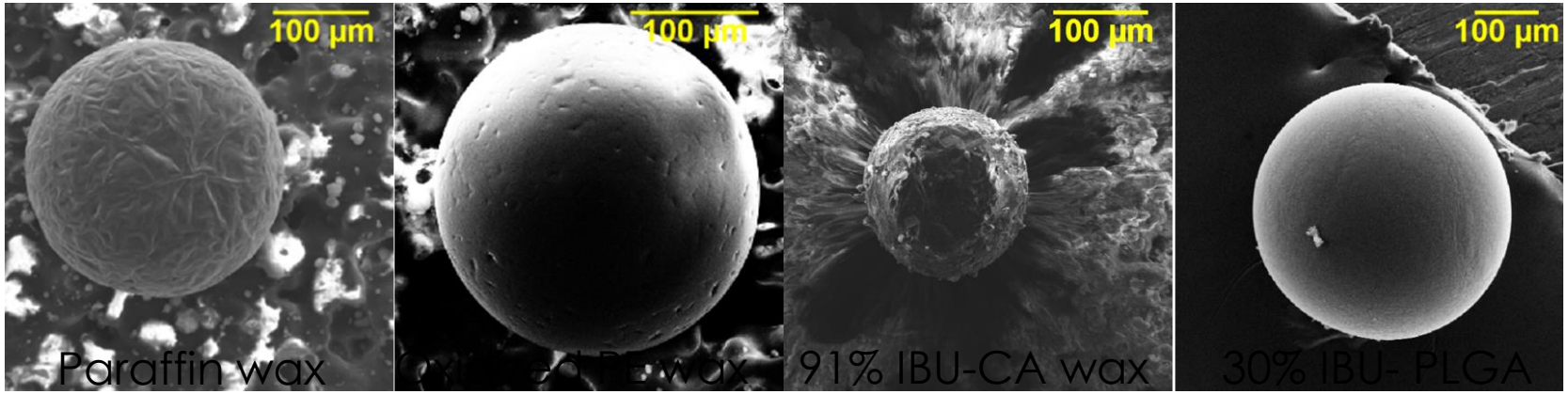


Molten polymer sphere Formation Process

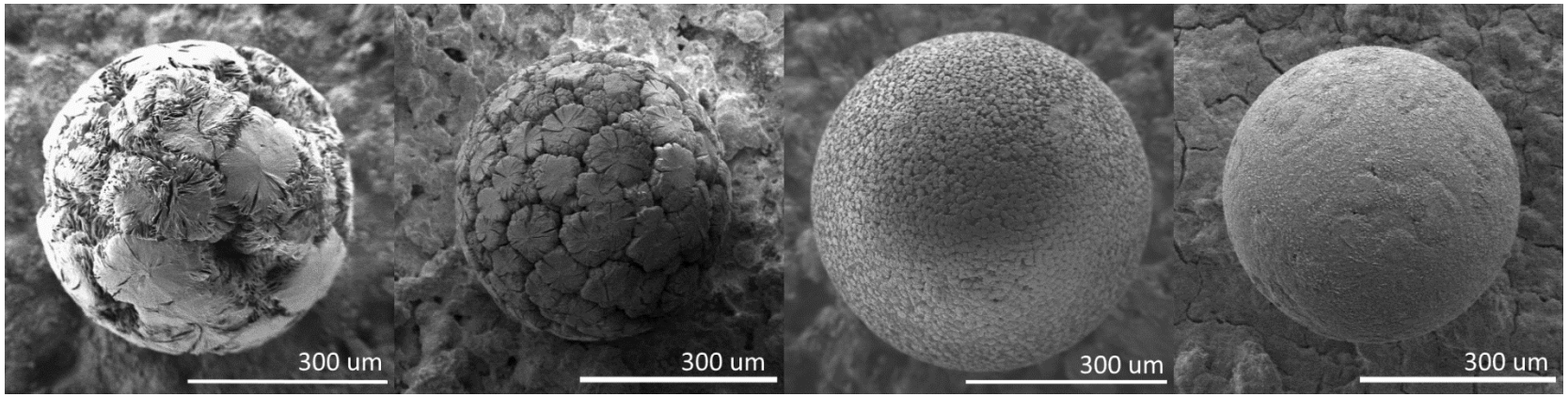


Shpigel et al., Eur J Pharm Biopharm. 2018

Microspheres from varying materials



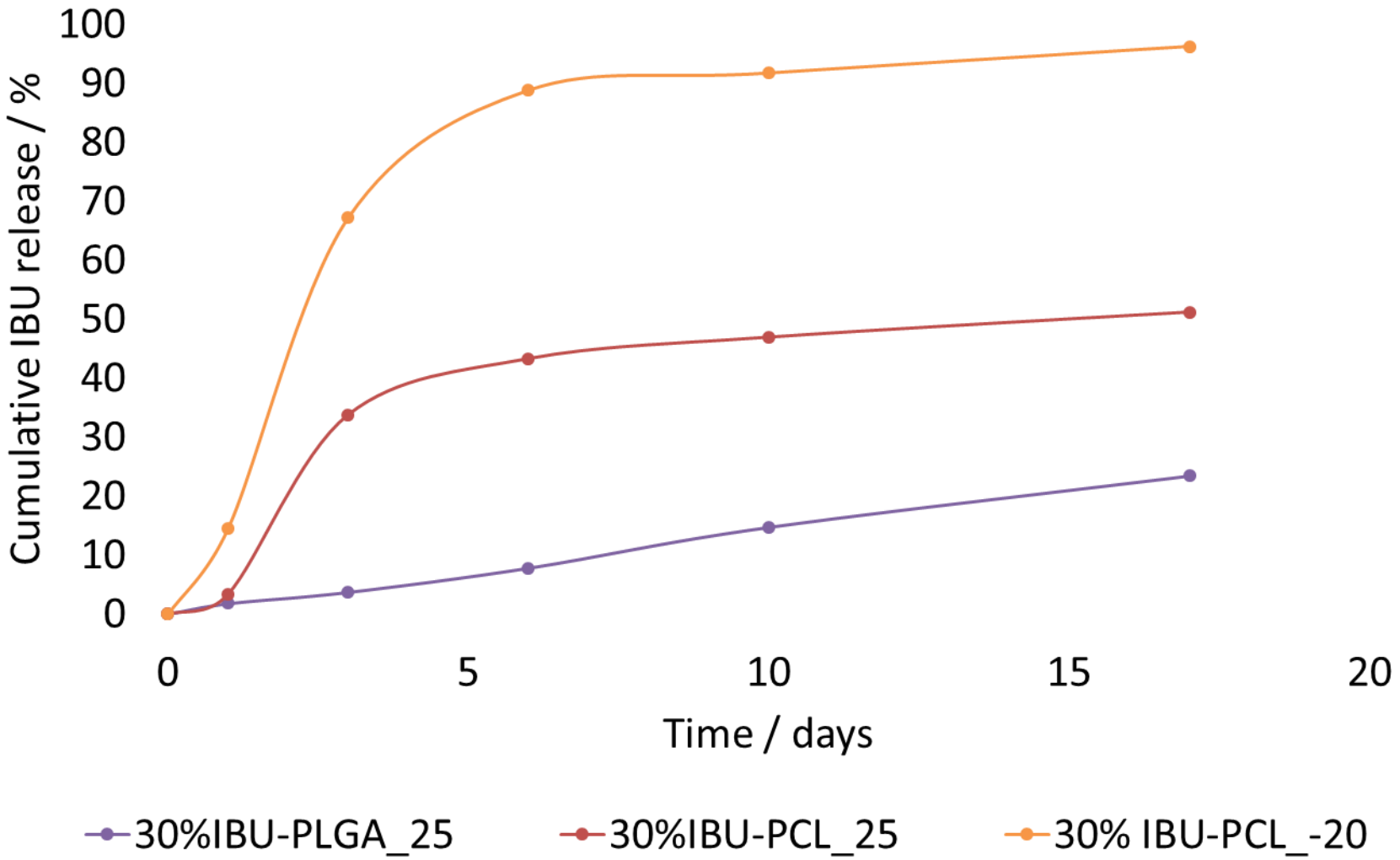
IBU-PCL microspheres (10,30, 50% IBU)



25 °C 5 °C -20 °C -80 °C

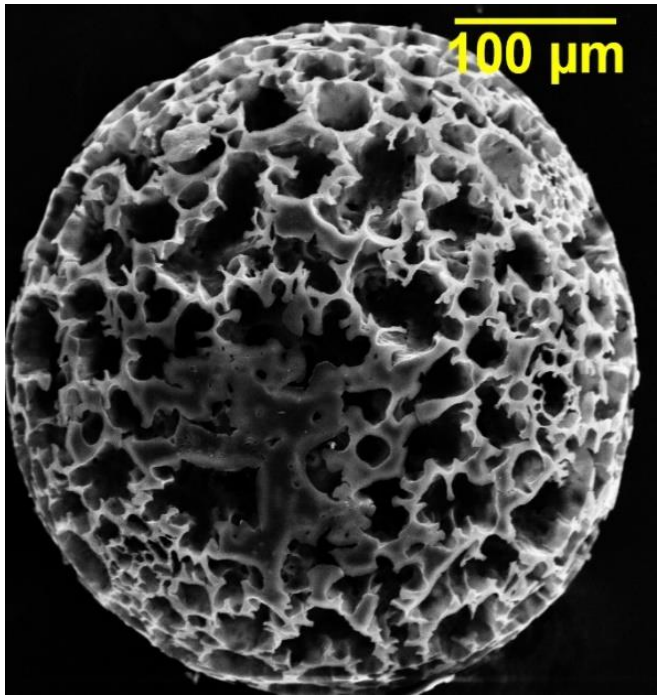
Shpigel et al., Eur J Pharm Biopharm. 2018

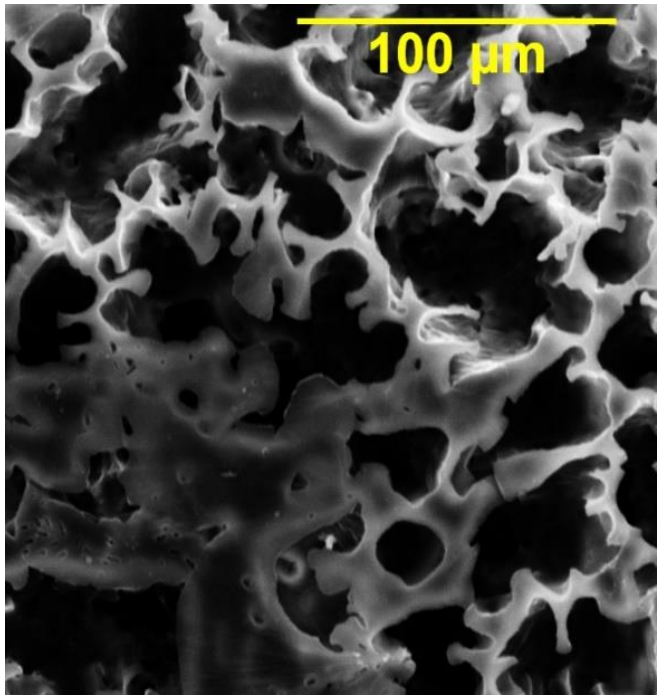
IBU release from printed microspheres

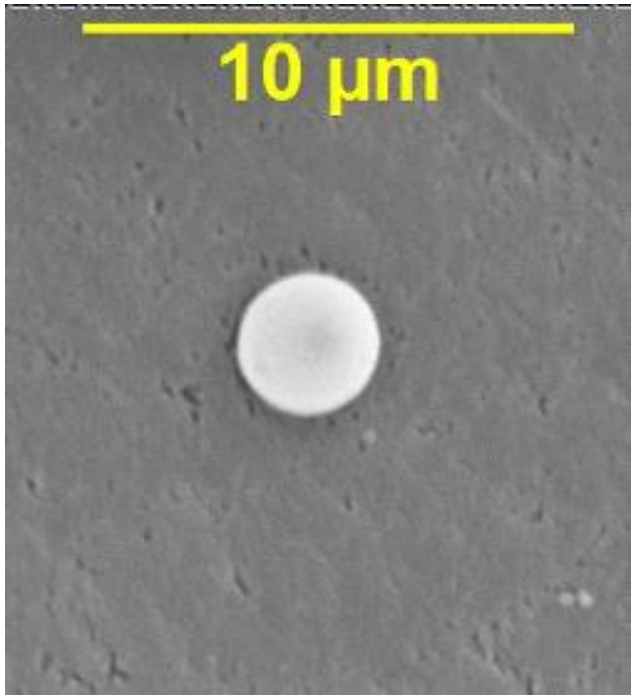


Shpigel et al., Eur J Pharm Biopharm. 2018

Porous and small-sized microspheres





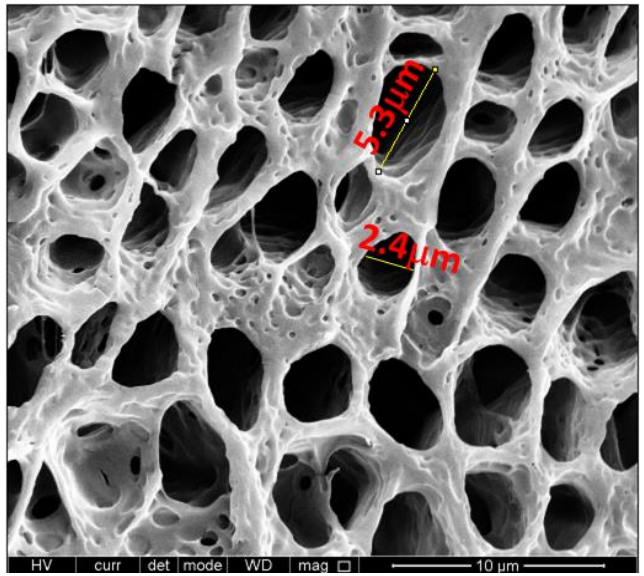


Potential uses

- Cell printing and delivery in various matrices
  - Synthetic and natural hydrogels, UV or physically crosslinkable.
- Delivery of growth factors, hormones, etc. in a controlled fashion.
- Potentially printable on pre-existing 3Ds structures.

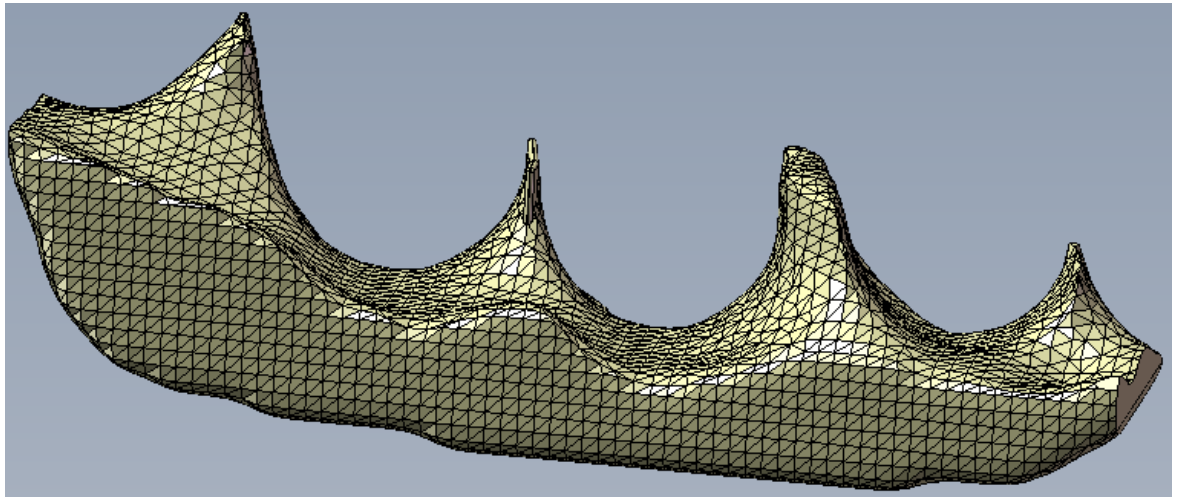
Double indirect printing of tissue engineering scaffolds

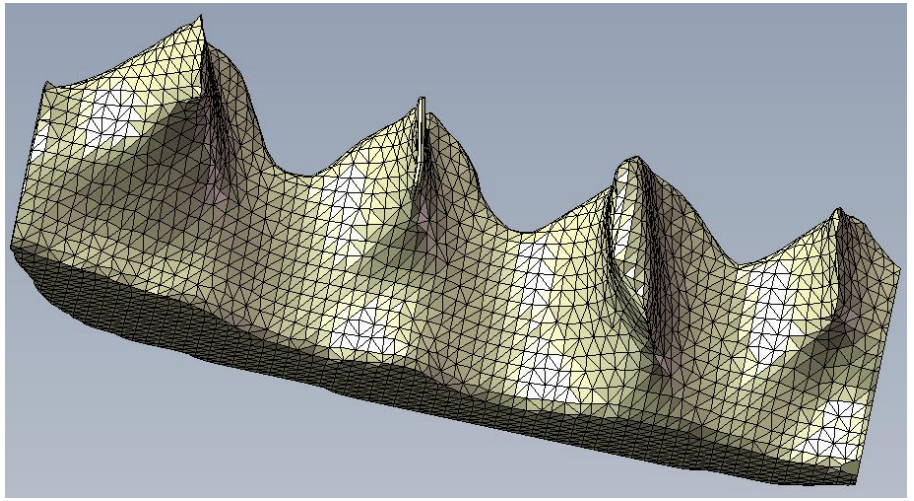
Generate anatomically accurate biodegradable tissue scaffolds



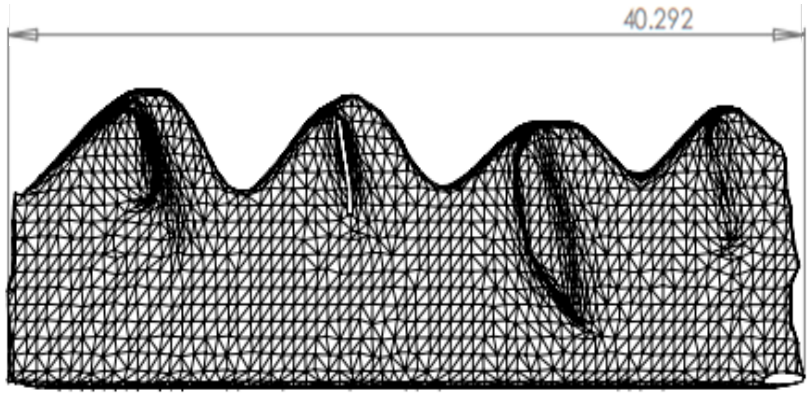
The process

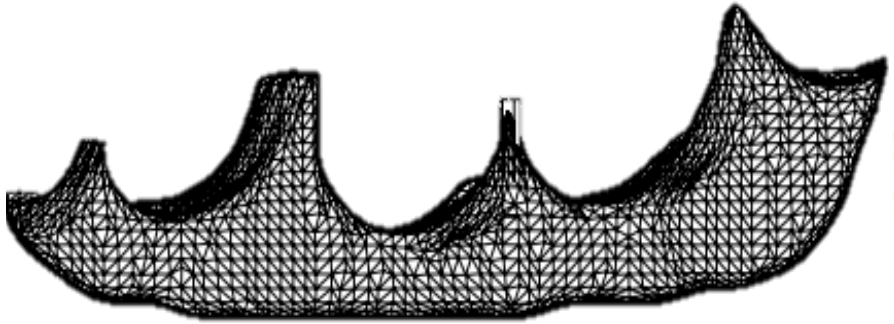
1. CT scan

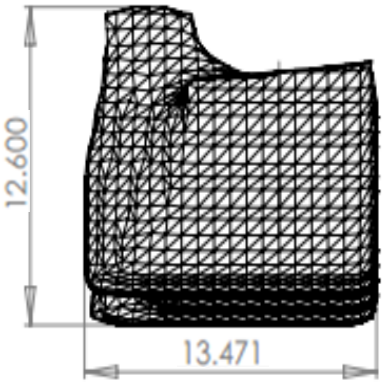




2. STL file

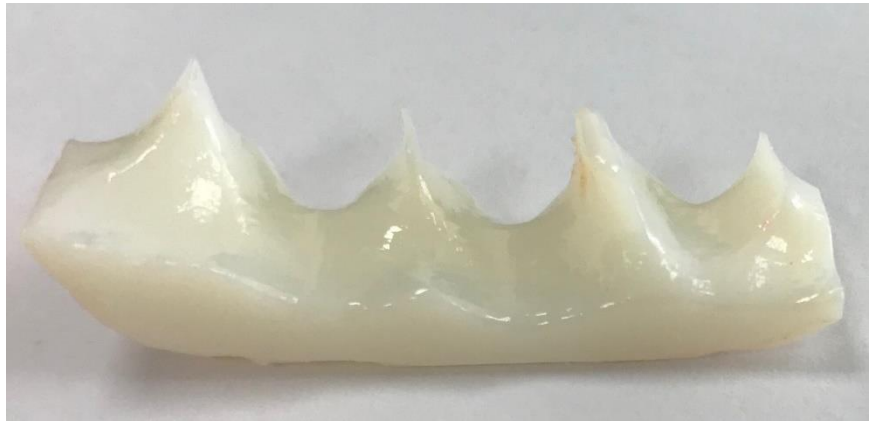






The process

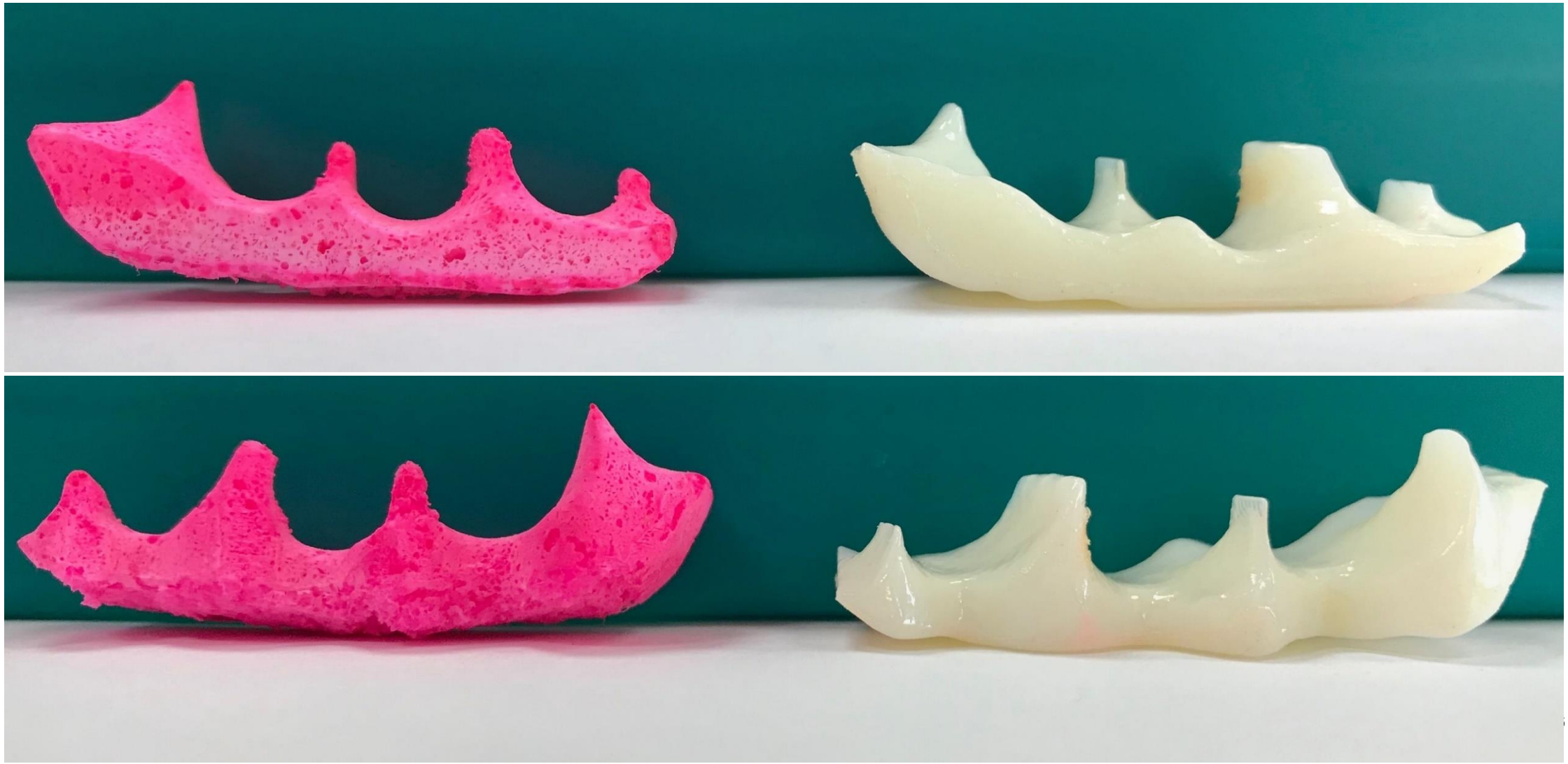
3. Print positive (Objet)



4. Generate mold

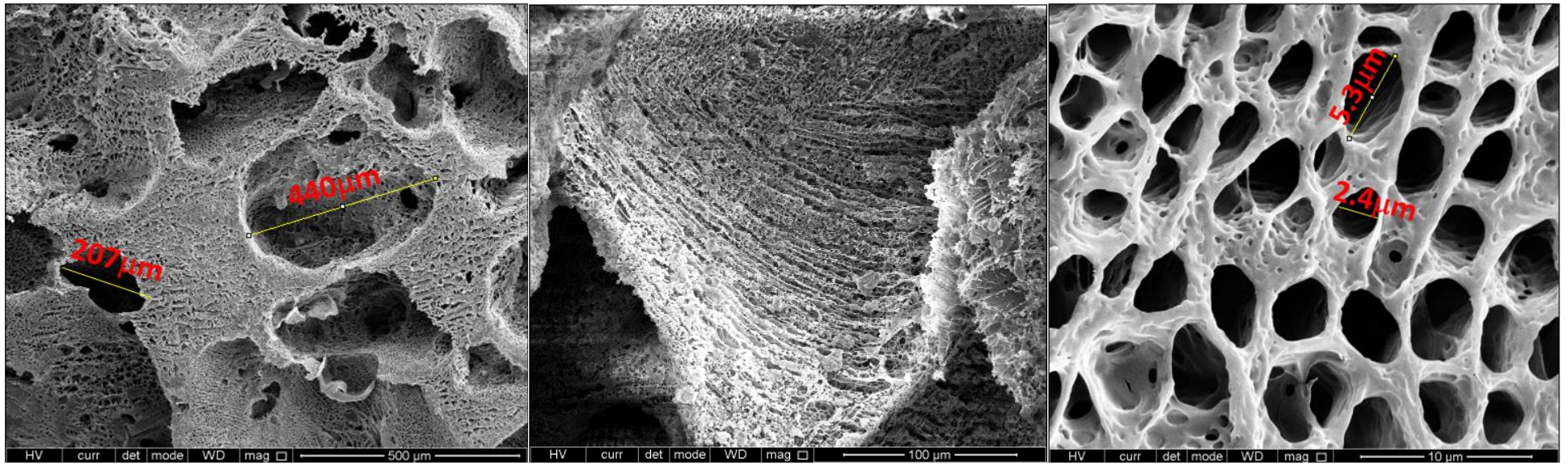
The process

5. Fabricate scaffold

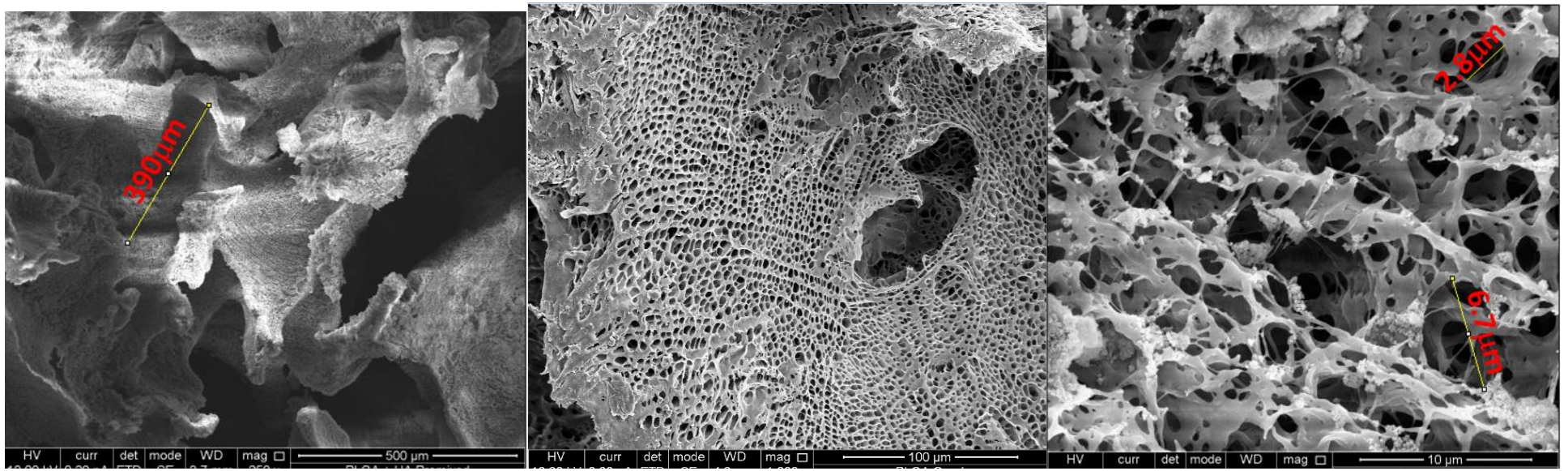


Bi-modal pore morphology

PLGA



PLGA +
20% HAP



Potential uses

- Generate anatomically relevant scaffolds
- Can be applied as cell-seeding/printing substrate
- Applicable in vivo and in vitro.