3D printed devices for the separation of biologics

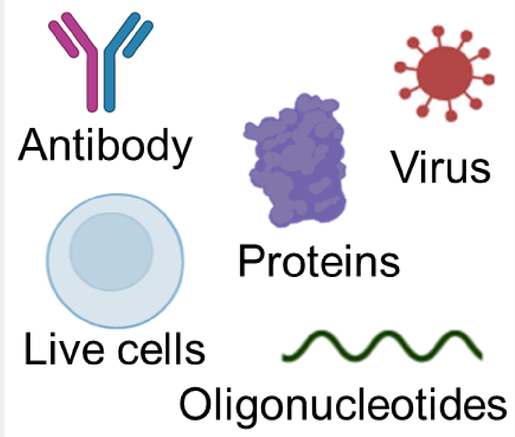
Mariachiara Conti[1], Jodie Symington[2], James Pullen[2], Simone Dimartino[1]

[1]Institute for Bioengineering, School of Engineering, University of Edinburgh, UK | [2]Fujifilm Diosynth Biotechnologies, Teesside, UK

Correspondence: m.conti@ed.ac.uk

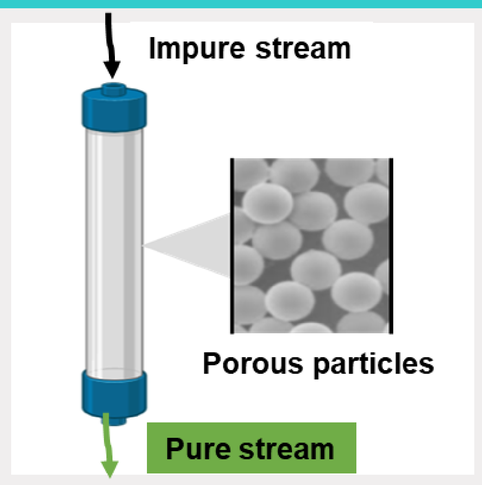
BACKGROUND

THERAPEUTICS



Challenges
- High purity (>99%)
- Difference in size
- Flexibility

CURRENT PURIFICATIONS



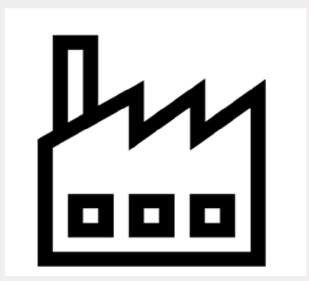
- Good performance

x Column bed irregularities

x Fluid dispersion

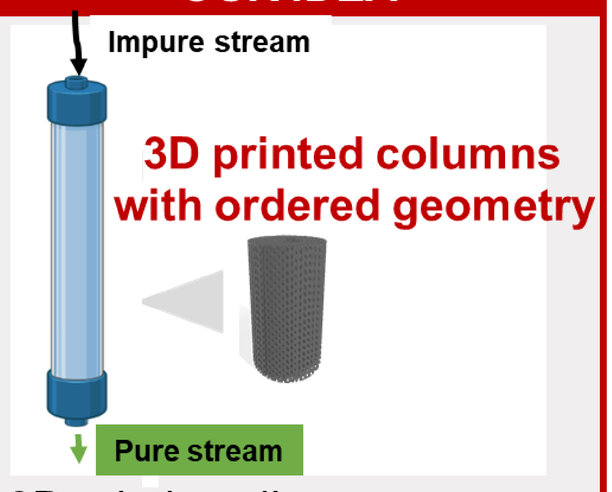
x Resin fouling

INDUSTRIAL CHALLENGE



Industrial interest in new technology with:
- ✓ Higher efficiency
- ✓ Higher flexibility
- ✓ More economical

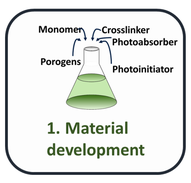
OUR IDEA



3D printing allows:
- Complex geometry
- Customisation on-demand
- Short time

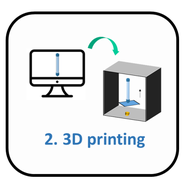
RESEARCH OUTCOMES

Development of a platform material for high resolution 3D-printing of ordered functional structures for protein capture.



The material formulation was adjusted to reduce printing time by 10 fold for a given layer thickness of 50 µm.

☑ **Fast printing**



Models could be 3D printed at resolutions up to 25 µm.

☑ **High resolution printing**

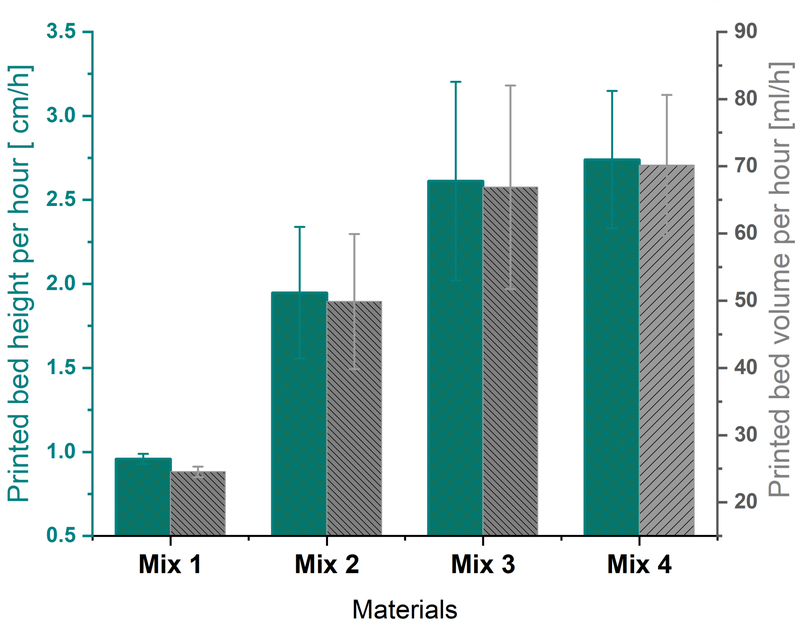


Figure 1: printing speed at different material compositions.

1 L column with 50 µm layer thickness

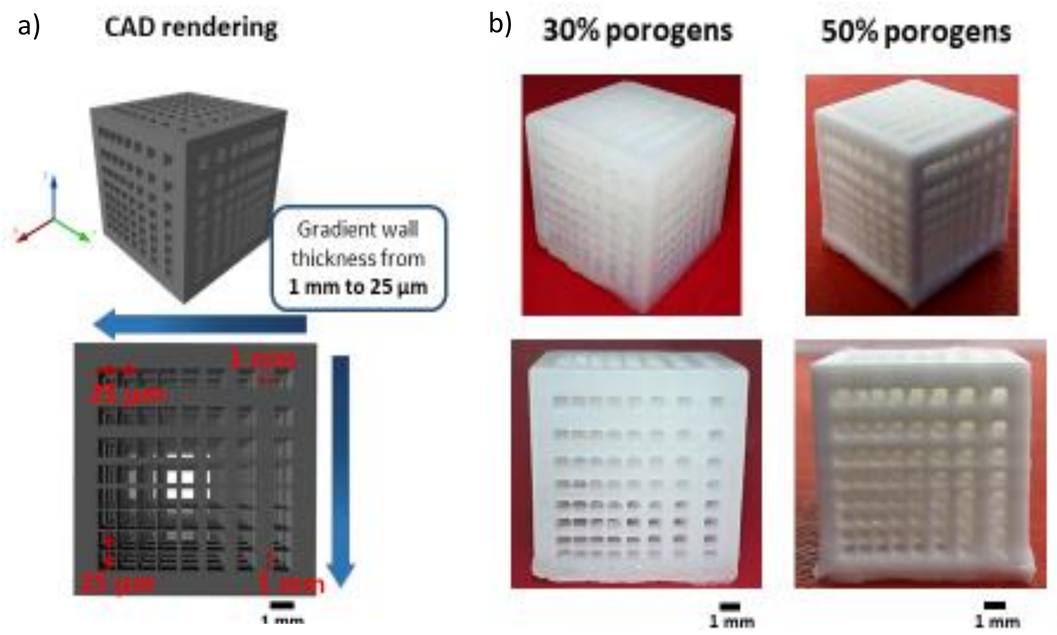
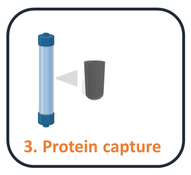
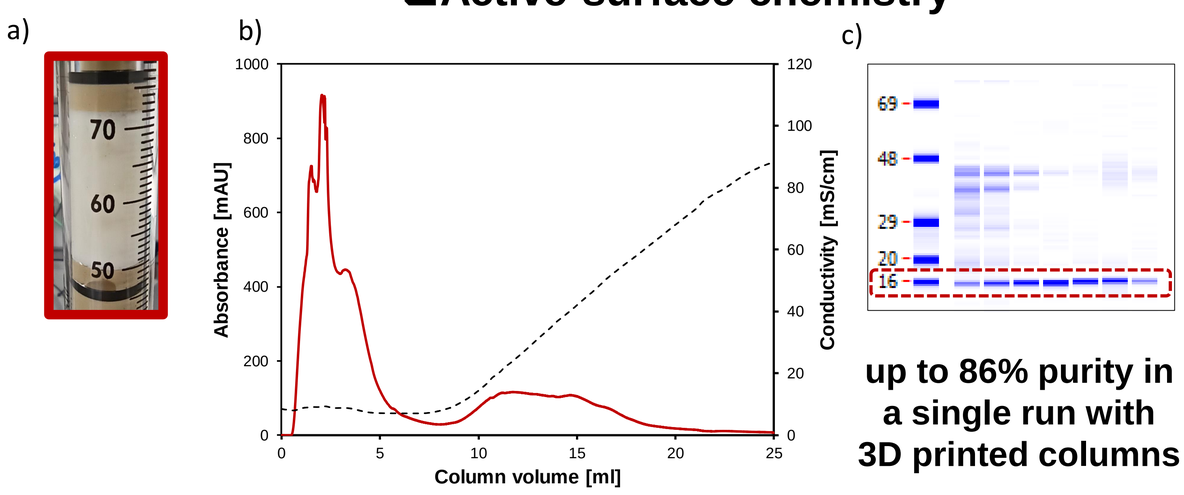


Figure 2: a) CAD rendering of resolution cubes with gradient wall thickness from 1 mm to 25 µm front and top views. b) Front and top photographs of diverse 3D printed structures according to CAD file printed with different material compositions.



3D printed Schoen gyroid columns with 300 µm channels bearing positive charged groups were tested for protein capture from clarified supernatant.

☑ **Active surface chemistry**



up to 86% purity in a single run with 3D printed columns

Figure 3: a) An example of the 3D printed column held in a glass casing. b) Chromatograms of model protein on the 3D printed porous columns with ordered geometry. c) Gel of captured protein in effluent from 3D printed columns.

CONCLUSIONS

- A novel platform material for rapid 3D printing was developed;
- The material could be reliably printed at resolution up to 25 µm;
- 3D printed columns successfully captured the model protein with up to 86% purity in a single run;
- Our current challenge is to investigate new functionalisation procedures to allow purification of different target molecules.

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