

## Droplet-based microfluidic method for synthesis of microparticles

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### INTRODUCTION

Droplet-based microfluidics has, in recent years, received increased attention as an important tool for performing numerous methods in modern day chemistry and biology such as the synthesis of hydrogel microparticles. Hydrogels have been used in many biological applications such as drug delivery, cell encapsulation and tissue engineering<sup>[1]</sup>.

### GENERATION AND CONTROL OF MICRODROPLETS

Water-in-oil (w/o) and oil-in-water (o/w) microdroplets and emulsions can be generated using microfluidic channels such as the flow focusing junction (**Figure 1**). The sizes of the microdroplets can be adjusted by controlling the flow rates of the dispersed phase and the continuous phase. The method has the capability to produce as high as 10 000 drops per second<sup>[2]</sup>.

### CONCLUSION AND OUTLOOK

The droplet-based microfluidic method offers a simple, flexible and robust method for generating emulsions of polymer solutions, which can be cross-linked to form hydrogels and other bio-microparticles.

### REFERENCES

- <sup>[1]</sup> Chung, B.G., Lee, K.H., Ali Khademhosseini, A. and Lee S.H. 2012. Microfluidic fabrication of microengineered hydrogels and their application in tissue engineering. *Lab on a Chip*, 12, 45–59.  
<sup>[2]</sup> Zhao, C.X. and Middelberg, A.P.J. 2011. Two-phase microfluidic flows. *Chemical Engineering Science*, 66, 1394–1411.

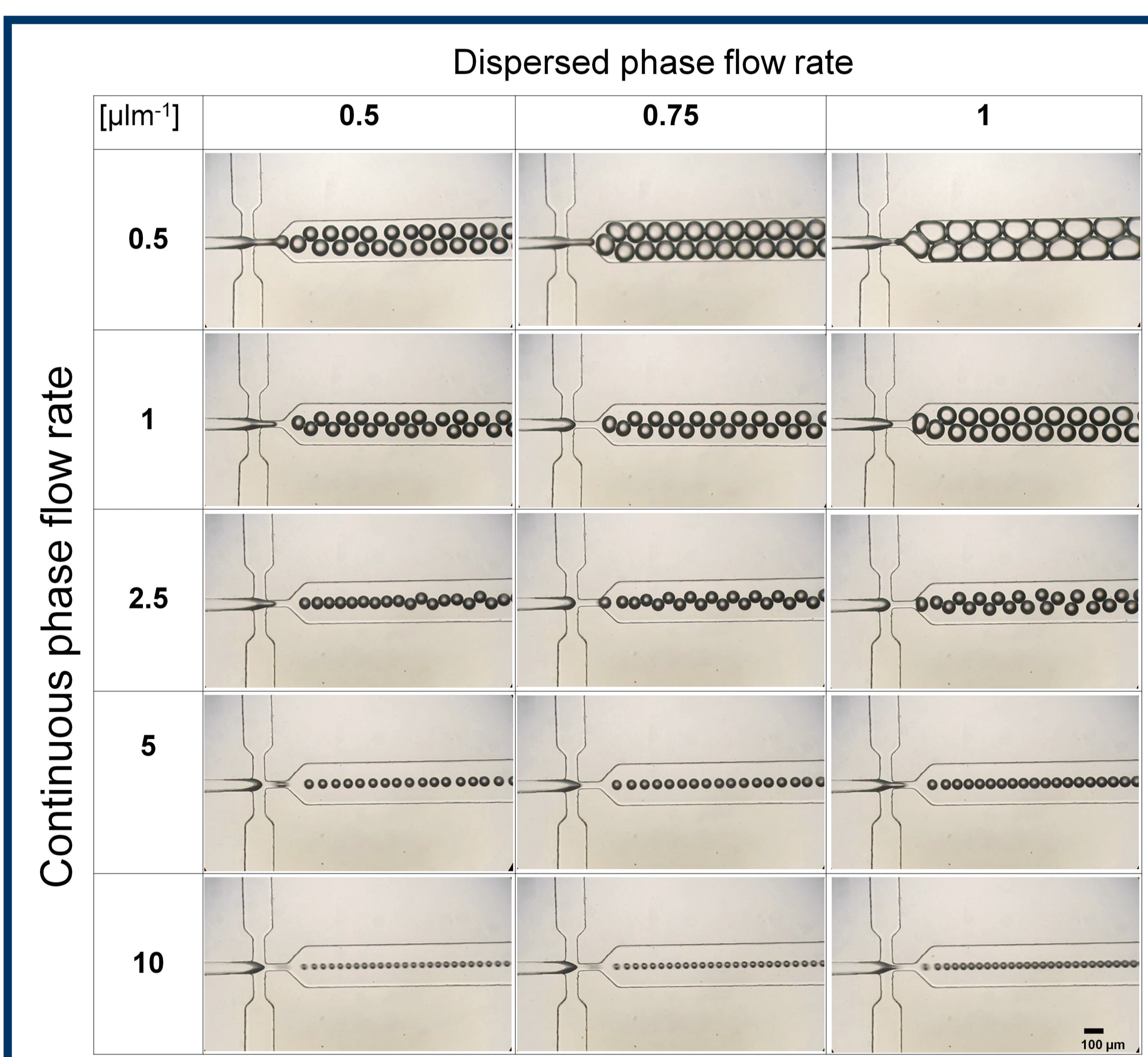


Figure 1: Generation and control of w/o droplets in flow focusing microfluidic channel

### MICROFLUIDIC-ASSISTED MICROPARTICLE SYNTHESIS

Microparticles, such as biologically-important hydrogel microspheres, can be fabricated from various polymers such as polyethyleneimine (PEI), chitosan and sodium alginate, using a microfluidic-assisted emulsion cross-linking method.

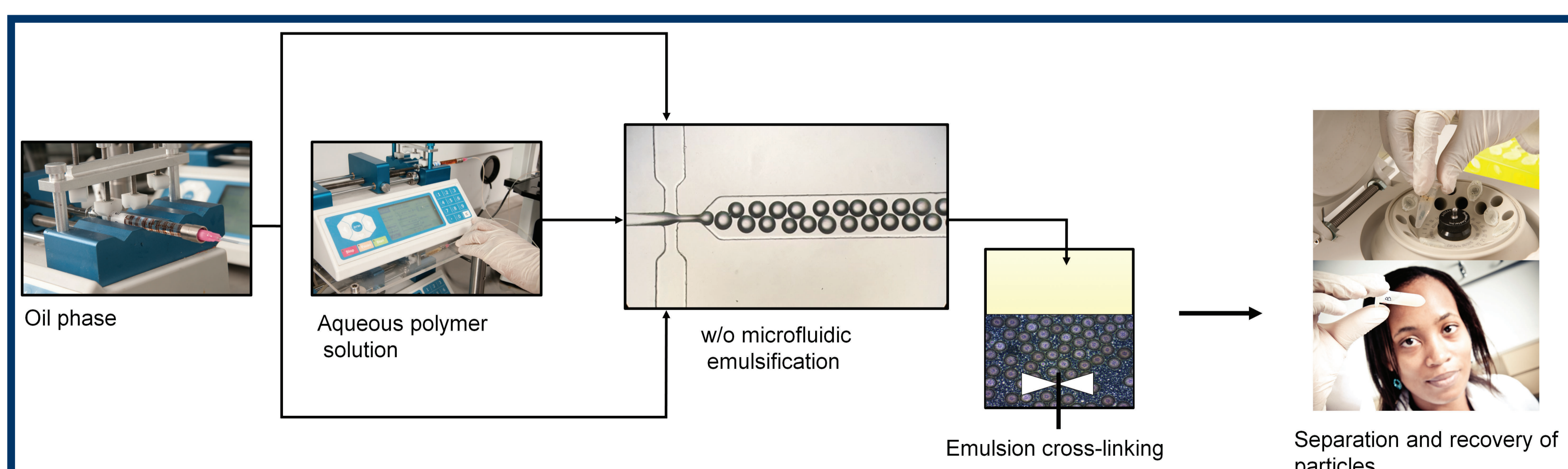
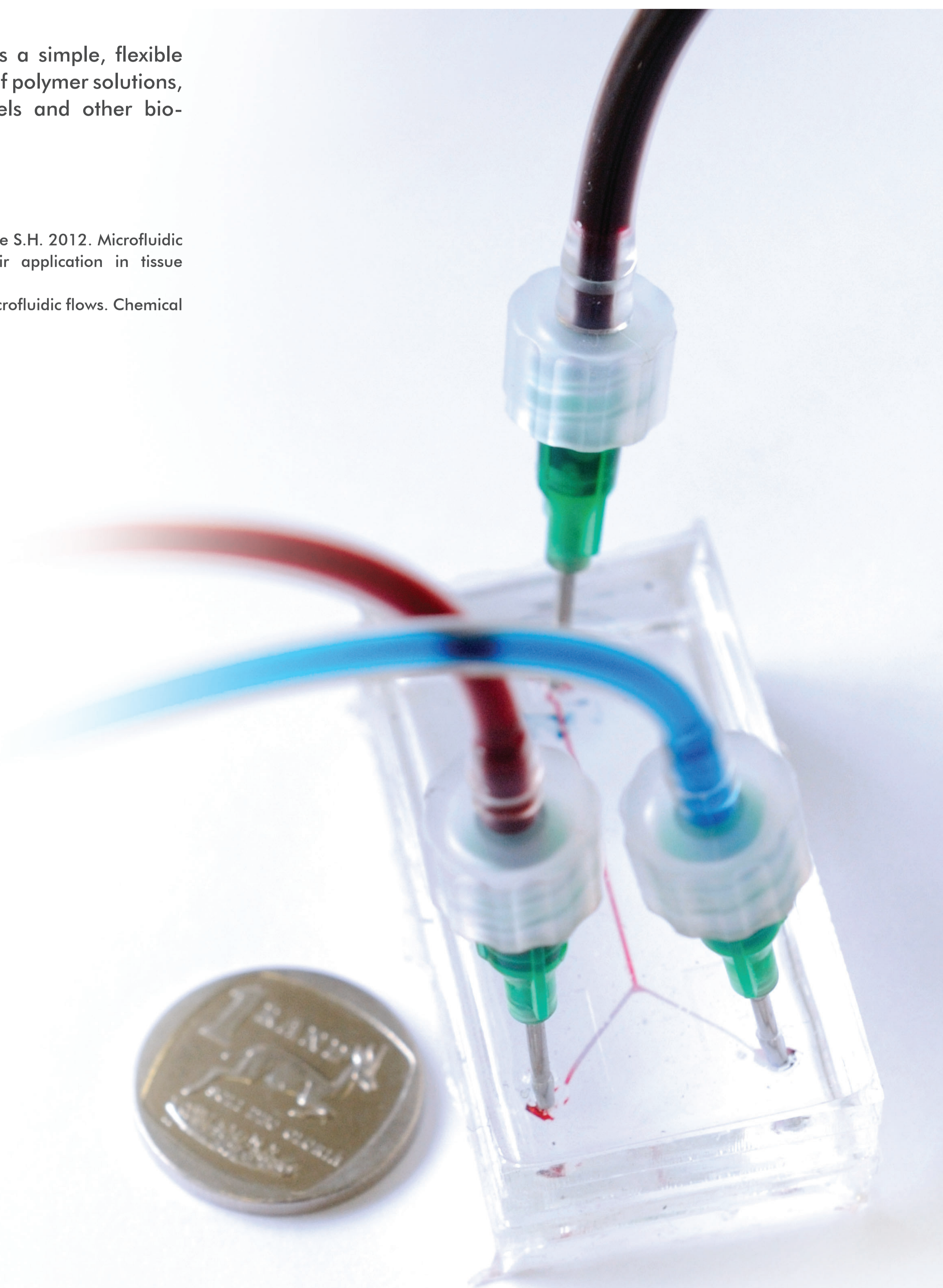


Figure 2: Droplet-based microfluidic method for the synthesis of microparticles by emulsion cross-linking



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