SUPPORTING INFORMATION

Continuous Synthesis of Elastomeric Macroporous Microbeads

Jeffrey A. Bennett, Zachary S. Campbell, and Milad Abolhasani*

North Carolina State University, Department of Chemical and Biomolecular Engineering, Raleigh, NC USA

E-mail: abolhasani@ncsu.edu
Webpage: www.abolhasanilab.com

S1-Flow-Focusing Microreactor

Figure S1 shows the schematic of the off-the-shelf fittings, capillaries, and fluidic connections utilized for constructing the coaxial flow-focusing microreactor.

Figure S1. The capillary-based flow focusing microreactor constructed using off-the-shelf components. The bottom inset shows a bright-field image of the coaxial inner capillaries inserted inside the outer capillary.
Inlet-side T-junction (Left) connections listed clockwise from the left:

**Polymer/crosslinker inlet line:** 1 mm OD × 0.75 mm ID × 4 cm long inner glass capillary inserted into 1/16” OD 0.04” ID FEP tubing and threaded through the long axis of the T-junction.

**Solvent/catalyst inlet line:** 1/16” OD FEP tubing connected to the perpendicular inlet of the T-junction.

**Outlet of first T-junction:** 1.5 mm OD × 1.12 mm ID × 6 cm long outer glass capillary with 1/8” OD x 1/16” ID Tygon sleeve fastened coaxially around inner capillary as it protrudes from the outlet of the T-junction.

Outlet side T-junction (Right) connections listed clockwise from the left:

**Inlet of second T-junction:** Other end of 1.5 mm OD × 1.12 mm ID x 6 cm long outer glass capillary with another 1/8” OD × 1/16” ID Tygon sleeve to fasten to the long axis of the outlet T-junction.

**Continuous phase inlet line:** 1/16” OD FEP tubing connected to the perpendicular inlet of the T-junction.

**Reactor outlet:** 1 mm OD × 0.75 mm ID × 10 cm long flamed-tip glass capillary with 1/16” OD 0.04” ID FEP sleeve fastened such that the two inner capillaries are separated by ~ 1.5 mm.

**S2-Non-Porous Microbeads (Control)**

Figure S2 shows the high degree of monodispersity obtained for the crosslinked non-porous PHMS microbeads (3:1 PHMS:hexadiene ratio) synthesized using the capillary-based microfluidic platform described in the paper.

![Figure S2](image_url)

**Figure S2.** Bright-field monolayer image of the PHMS microbeads synthesized using the developed 3D flow-focusing microreactor with PHMS:hexadiene ratio of 3:1.
S3-Silica-Loaded PHMS Microbeads

Figure S3 shows the high degree of monodispersity obtained for the (crosslinked) silica-loaded PHMS microbeads (5 µm silica microspheres, 5:1 PHMS:hexadiene ratio) synthesized using the capillary-based microfluidic platform described in the paper.

Figure S3. Bright-field monolayer image of the silica-loaded PHMS microbeads synthesized using the developed 3D flow-focusing microreactor with 5µm silica microspheres and PHMS:hexadiene ratio of 5:1.
S4-Example Rheometer Compression Data

Figure S4 shows an example of data obtained for a non-porous PHMS microbead (control) from the compression test using the rheometer in parallel plate configuration.

Figure S4. Measured normal force vs. the parallel plate gap for an in-flow synthesized dense PHMS microbead with PHMS:hexadiene ratio of 3:1. The overlay of the compression/relaxation curves demonstrate the elasticity of the PHMS microbeads without hysteresis.
**Supplementary Videos:**

**Video M-1** The droplet production videos of the flow-focusing microreactor for a porogen-free control and a silica-loaded test using a high-speed camera. Porogen-free flow parameters: $Q_1 = 10 \, \mu\text{L/min}$, $Q_2 = 5 \, \mu\text{L/min}$, and $Q_3 = 200 \, \mu\text{L/min}$ with 5:1 PHMS:hexadiene ratio. Silica-loaded flow parameters: $Q_1 = 10 \, \mu\text{L/min}$, $Q_2 = 10 \, \mu\text{L/min}$, and $Q_3 = 200 \, \mu\text{L/min}$ with 5:1 PHMS:hexadiene ratio and 10 µm silica microspheres.

**Video M-2** Reconstructed MicroCT volume renderings of multiple microbeads and single microbead sweep cut for the silica-loaded and macroporous PHMS microbeads. Microbeads were produced using $Q_1 = 10 \, \mu\text{L/min}$, $Q_2 = 10 \, \mu\text{L/min}$, and $Q_3 = 300 \, \mu\text{L/min}$ with 5:1 PHMS:hexadiene ratio and 5 µm silica microspheres.