

## Supplementary Materials

**Video 1.** Optically trapping of beads within the exclusion zone. Time between frames is 40 ms (frame rate = 25/min). Carboxylated 2- $\mu\text{m}$ -diameter beads introduced into a Parafilm-based microfluidic device. A group of beads is captured at 1 s. Trap is turned off at 15 s.

**Video 2.** Kinetics of EZ formation as a function of incubation time. Start of the experiment ( $t = 0$  min). Nafion disc in the reactor of a PDMS-based microfluidic device was washed with 1 mM  $\text{Na}_2\text{HPO}_4$ . Diameter of carboxylated polystyrene beads is 1  $\mu\text{m}$ . Time between frames is 500 ms.

**Video 3.** Kinetics of EZ formation as a function of incubation time ( $t = 60$  min). Time between frames is 500 ms.

**Video 4.** Kinetics of EZ formation as a function of incubation time ( $t = 110$  min). Time between frames is 500 ms.