Supporting Information

Continuous and High-throughput Electromechanical Lysis of Bacterial Pathogens using Ion Concentration Polarization

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Supplementary Videos

Video S1: Visualization of the batch-mode electromechanical lysis

Video S2: Collection of lysates (GFP) during continuous mode electromechanical lysis

Supplementary Figures

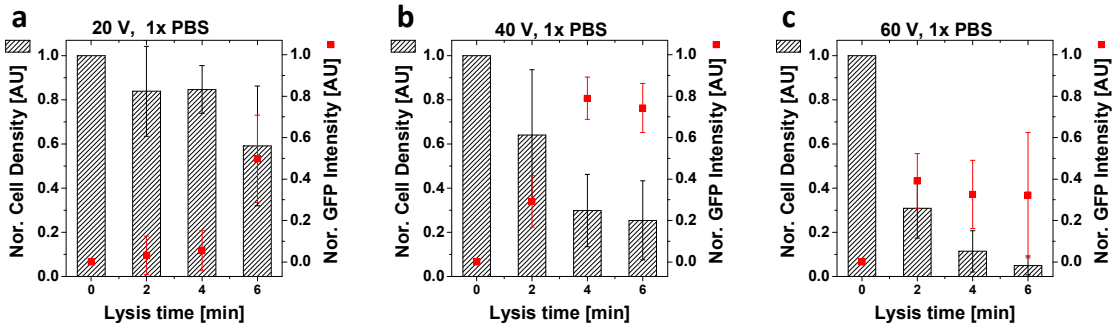

Figure S1. Electromechanical lysis of bacterial cells in a high salinity solution. A batch mode bacterial lysis was tested with a high salinity buffer (1× PBS), which showed a similar trend with the results obtained from a moderate salinity solution (0.1× PBS buffers, Figure 2). **a–c**, Quantification of lysis results in various electric potentials and operational time: 20 V (a), 40 V (b), and 60 V (c). The excessive lysis condition showed high lysis efficiency but the GFP yield was reduced due to overprocessing. The cell density was normalized by the input (0 min) cell number while the GFP intensity was normalized by the maximal GFP recovery value in the lysis experiments.

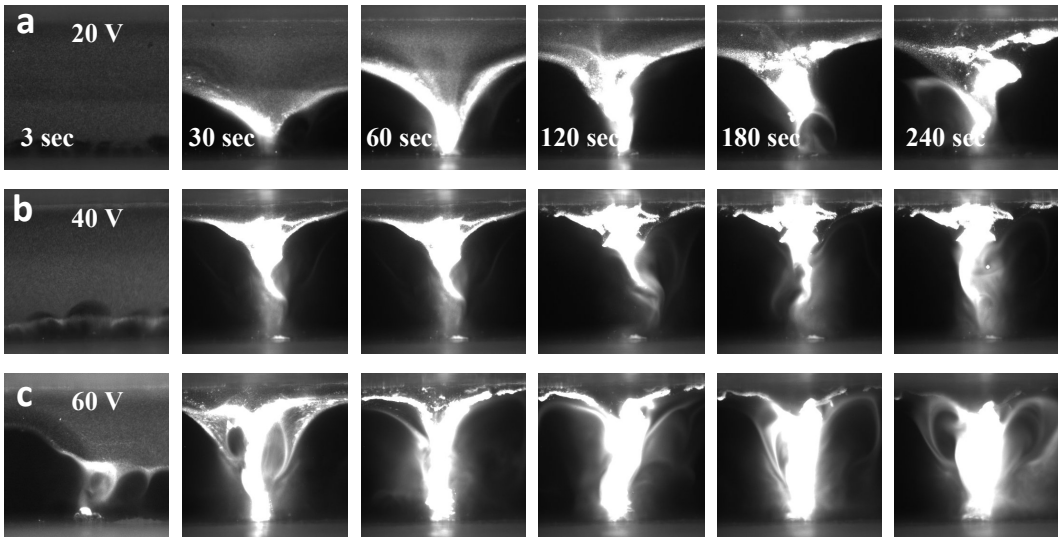

Figure S2. Time-lapse images for visualization of the bacterial lysis. a–c, Fluorescence images were obtained over the lysis process time in order to observe formation of bacterial concentrated plugs and lysis in a real-time manner. The bacterial cells were first concentrated between vortices where the electric field was focused on the spot, and gradually lysed over time according to the applied electric fields. The high field induced fast and strong vortices, leading to more rapid extraction of intracellular GFP molecules.

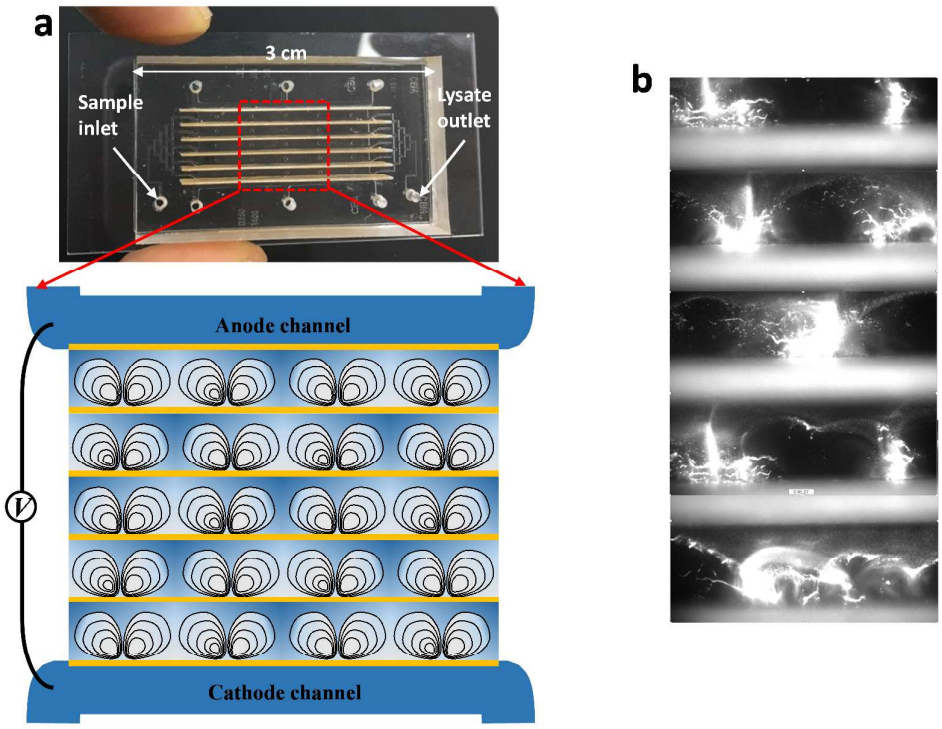

Figure S3. Parallelization of the electromechanical lysis by lateral stacking. a, The single lysis unit, CEM and lysis channel was parallelized by using common electrolyte rinsing channels with a single electrode set. This lateral parallelization was enabled because of the unipolar ISM (cation exchange membrane) setting, which is simple and symmetrical. The parallelized device was designed to have a common sample inlet and outlet that evenly distribute fluid into each lysis channel. **b**, Fluorescent images were obtained for visualizing lysis of GFP-expressing *E. coli* in a 0.1× PBS solution. We applied 100 V through the stacked channels to maintain ~20 V per single lysis unit. The images were taken at 2 min after initiation of the lysis.