Supporting Information

Liquid Z-diode

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Video S1. Local break of diodicity and stepwise propagation of the liquid front in response to compression in flexible liquid diodes.

Video S2. Microscopic imaging of compression actuated local break of diodicity mechanism in liquid diodes.

Video S3. Microscopic imaging of the mechanism of upward bending actuated local break of diodicity mechanism in liquid diodes.

Video S4-S6. Controlled actuation of mixing in a model system of microreactor made of a row of liquid diodes Video S4: mixing initiation on the left, following forward flow. Video S5: mixing initiation in the middle, following forward flow and timed mechanically actuated reverse flow. Video S6: mixing initiation on the right, following mechanically actuated reverse flow and halted forward flow.

Video S7. "X" compression, parallel to the flow direction, in a row of flexible liquid diodes, showing no effect.

Video S8. Sequence dependent fluidic pathway in L-shaped design, under "YX" compression sequence.

Video S9. Sequence dependent fluidic pathway in L-shaped design, under "XY" compression sequence, showing a different final state.

Video S10. Compression with acceleration on the diode's walls of 46 mm/s^2 ± 9 mm/s^2, resulting in a stable diode and no reverse flow.

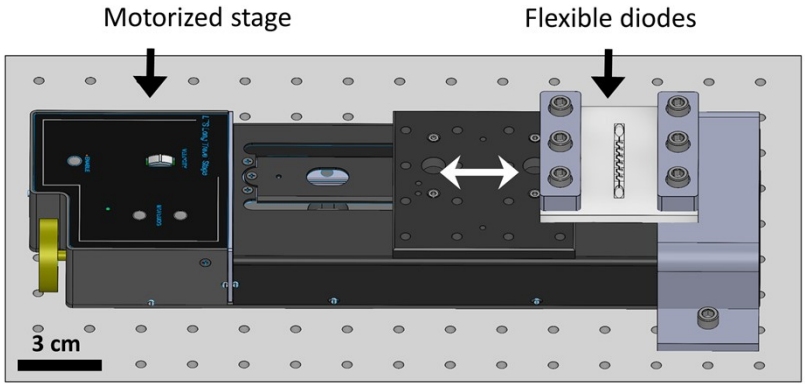

Figure S1. A motorized stage is used to apply reversible compression on the flexible liquid diodes. The sample can be rotated by 90 degrees.

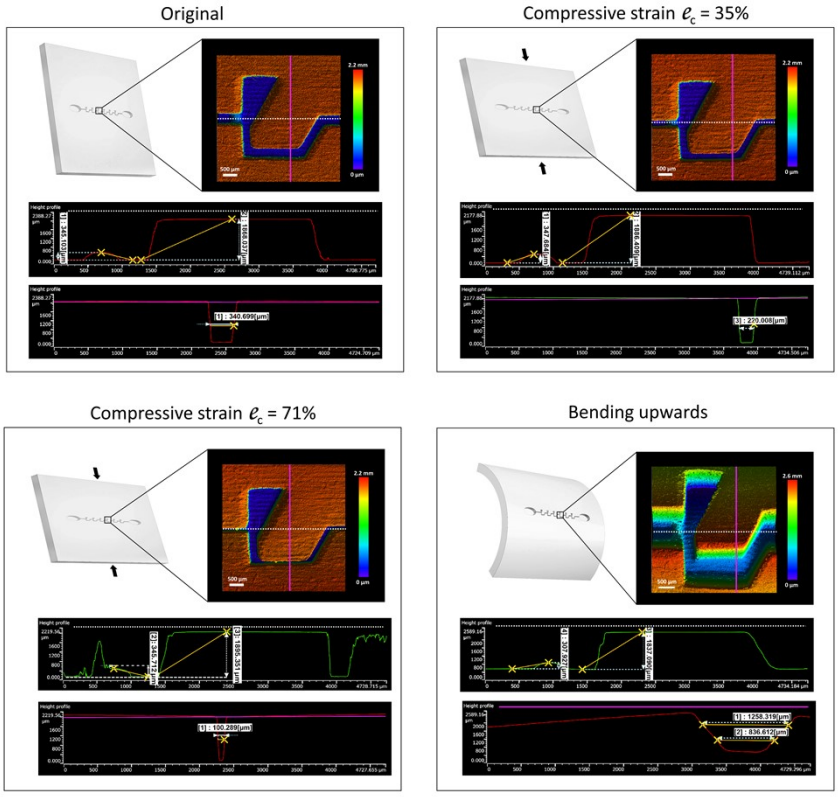

Figure S2. A three-dimensional quantitative description of the flexible liquid diodes under different degrees of compression and bending using high-resolution confocal microscopy. Strain during compression is defined as $l_c = |l - l_o|/l_o$, with l- the length under compression and l_o- the original length.