Electronic Supplementary Material (ESI) for Lab on a Chip.

Supplementary material

Polycaprolactone enabled sealing and carbon composite electrode integration into electrochemical microfluidics

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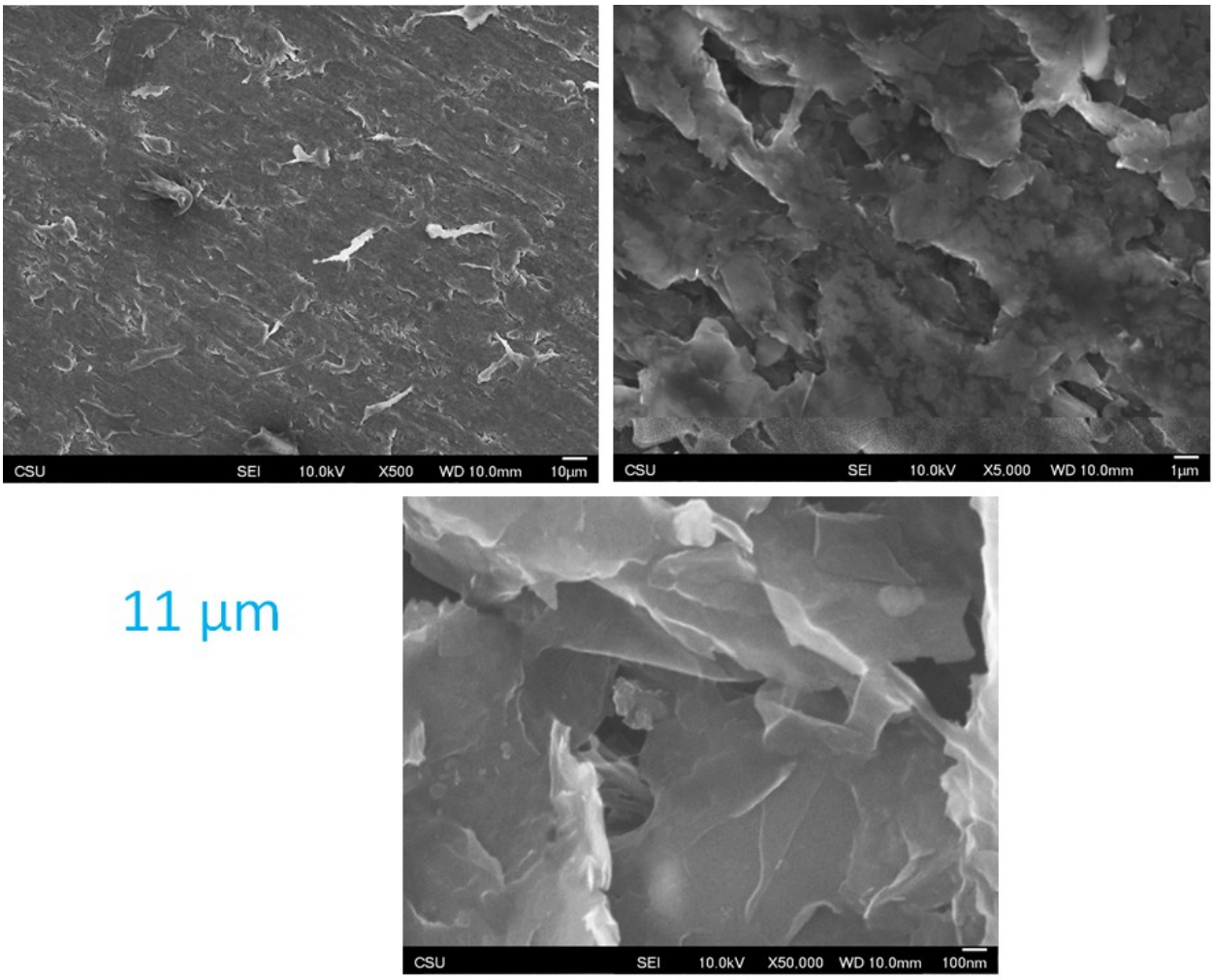

Figure S1 SEM images of a 1:2 11 µm electrode

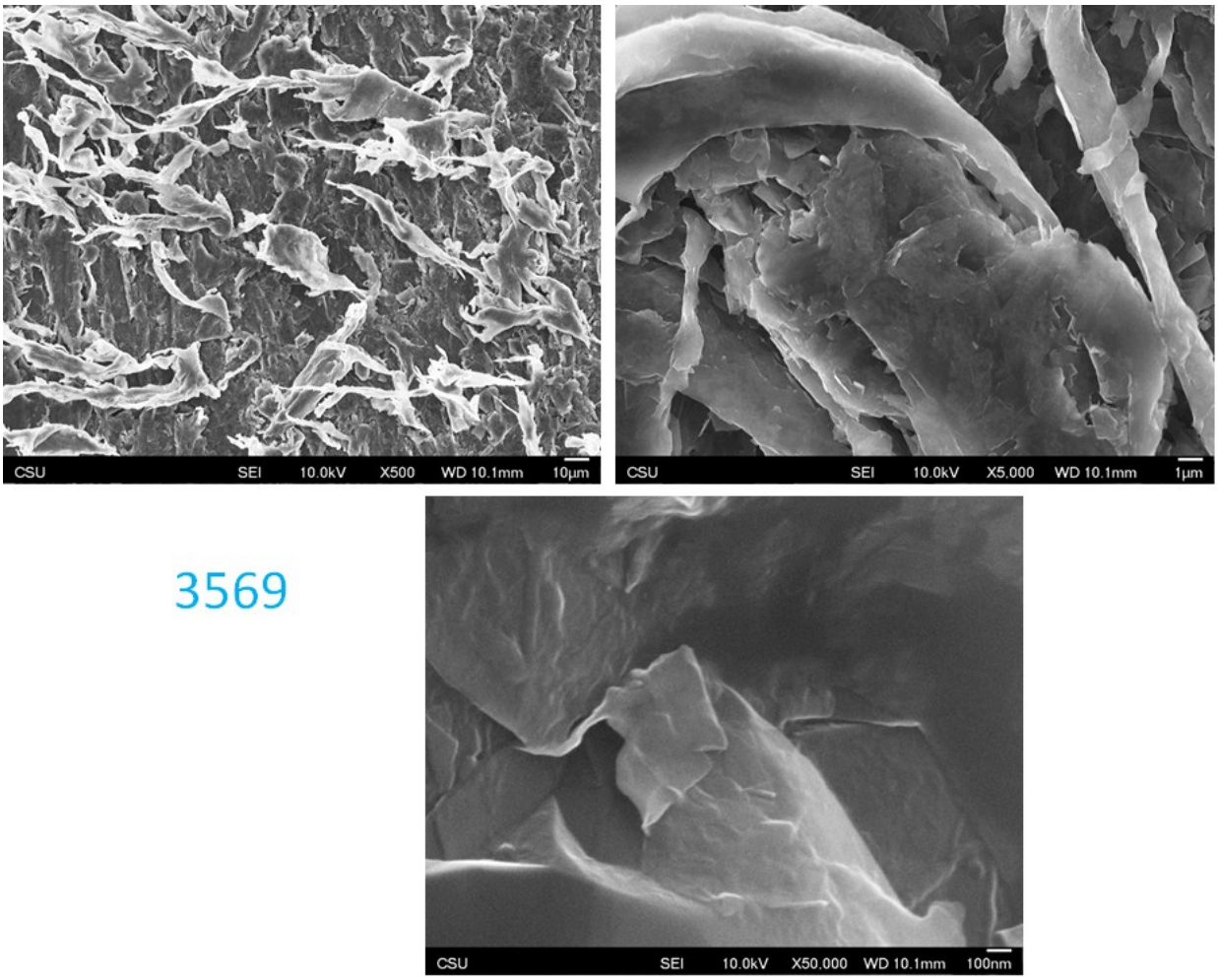

Figure S2 SEM images of a 1:2 3569 electrode

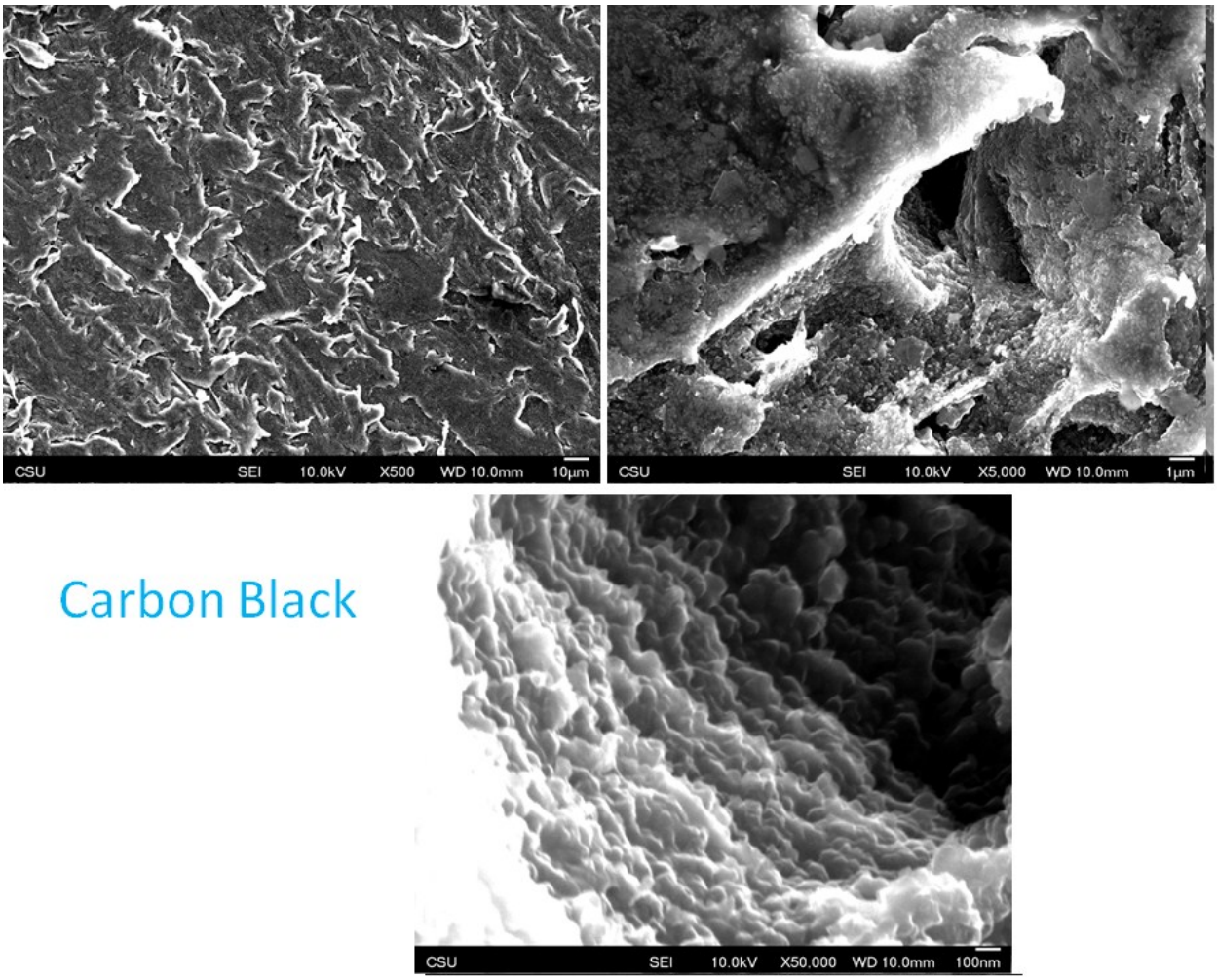

Figure S3 SEM images of a 3:4 Carbon Black electrode

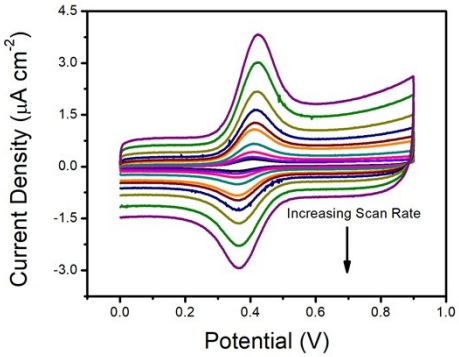

Figure S4 Representative CV's for scan rate study for 1 mM $FcTMA^+$ in 0.5 M KNO3 on 1:2 PCL:MG-1599 electrode (v = 25, 50, 100, 200, 400, 500, 700, 1000, 1500, 2000 mV/s).

Scan Rate (mV/s)	ΔE (mV)					
	1:2 PCL:11 micron	1:4 PCL:11 micron	1:2 PCL:3569	1:4 PCL:3569	1:2 PCL:MG-1599	1:4 PCL:MG-1599
25	56 ± 5	54 ± 2	50 ± 5	53 ± 3	55 ± 8	57 ± 6
50	53 ± 4	55 ± 0	53 ± 8	58 ± 8	53 ± 5	56 ± 4
100	56 ± 2	52 ± 6	53 ± 5	56 ± 1	46 ± 2	51 ± 5
200	49 ± 2	52 ± 3	52 ± 9	54 ± 3	47 ± 3	51 ± 5
400	54 ± 5	57 ± 4	51 ± 10	54 ± 4	55 ± 5	56 ± 2
500	55 ± 3	58 ± 4	54 ± 10	59 ± 2	56 ± 3	59 ± 1
700	56 ± 7	59 ± 1	51 ± 2	59 ± 2	55 ± 6	59 ± 1
1000	63 ± 3	64 ± 4	59 ± 5	59 ± 4	56 ± 4	60 ± 2
1500	61 ± 3	70 ± 1	61 ± 6	67 ± 1	55 ± 3	65 ± 2
2000	61 ± 1	70 ± 3	70 ± 4	64 ± 3	58 ± 1	66 ± 4

Table S1 Scan rate study for 1 mM FcTMA+ in 0.5 M KNO_3, error from standard deviation of 3 different electrodes.

Scan Rate (mV/s)	ΔE (mV)					
	1:2 PCL:11 micron	1:4 PCL:11 micron	1:2 PCL:3569	1:4 PCL:3569	1:2 PCL:MG-1599	1:4 PCL:MG-1599
25	72 ± 5	74 ± 4	77 ± 7	69 ± 2	75 ± 2	75 ± 7
50	79 ± 7	76 ± 6	81 ± 8	73 ± 2	79 ± 3	79 ± 5
100	85 ± 6	81 ± 5	88 ± 11	77 ± 2	84 ± 3	88 ± 6
200	95 ± 6	86 ± 8	94 ± 14	83 ± 6	95 ± 5	98 ± 10
400	107 ± 10	100 ± 8	103 ± 13	93 ± 6	106 ± 7	116 ± 10
500	115 ± 9	103 ± 10	107 ± 13	97 ± 8	111 ± 10	119 ± 12
700	121 ± 5	108 ± 7	111 ± 13	101 ± 9	119 ± 9	127 ± 13
1000	131 ± 8	119 ± 8	110 ± 13	108 ± 10	128 ± 9	140 ± 15
1500	136 ± 11	131 ± 6	116 ± 9	115 ± 15	132 ± 8	155 ± 19
2000	142 ± 10	143 ± 9	124 ± 11	119 ± 19	135 ± 9	163 ± 17

Table S2 Scan rate study for 5 mM ferri/ferrocyanide in 0.5 M KNO_3, error from standard deviation of 3 different electrodes.

The heterogeneous electron transfer rate constants (k^0) were calculated using the Nicholson method.[40] The following equation was used:

$$\psi = k^0[\pi DnFv/RT]^{-1/2}$$

The kinetic parameters (ψ) from the average ΔEs of the ferri/ferrocyanide peaks for each scan rate were plotted versus $[\pi DnFv/RT]^{-1/2}$ where D is the diffusion coefficient, F is Farady's constant, v is the scan rate, R is the ideal gas constant, and T is temperature. The rate constants

were determined from the slopes of the regression lines and the error shown is the standard error of the slope.

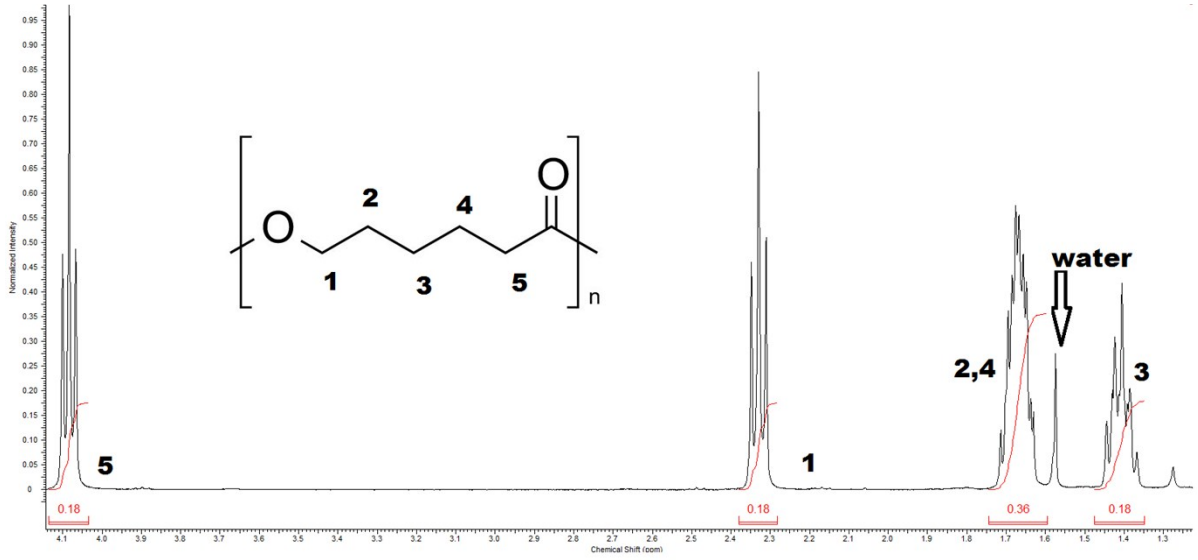

Figure S5 [1]H-NMR spectra of ThermoMorph polymer in CDCl3.

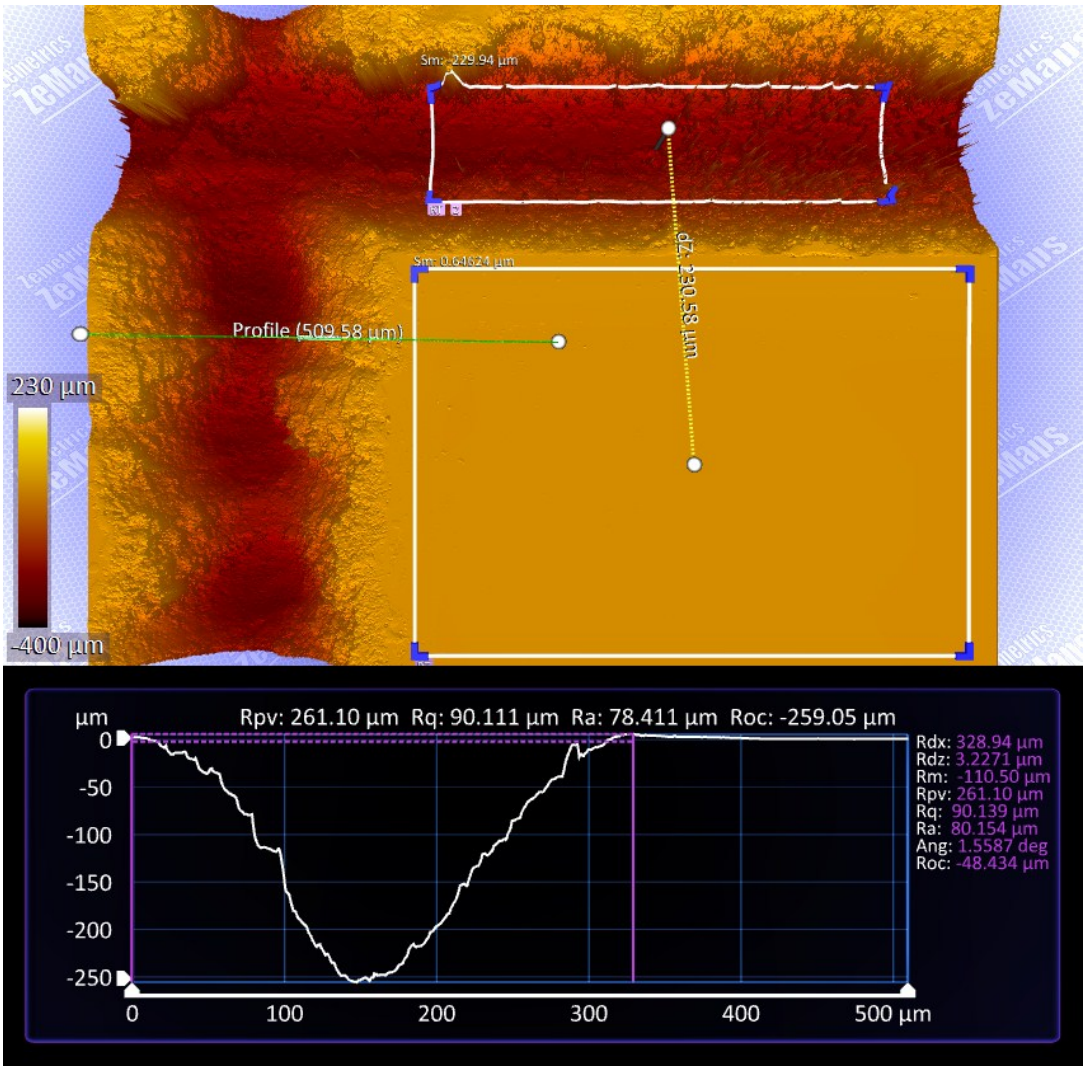

Figure S6 Optical profilometry of a channel cut into a droplet generator of a single pass in the X-axis of the laser cutter.

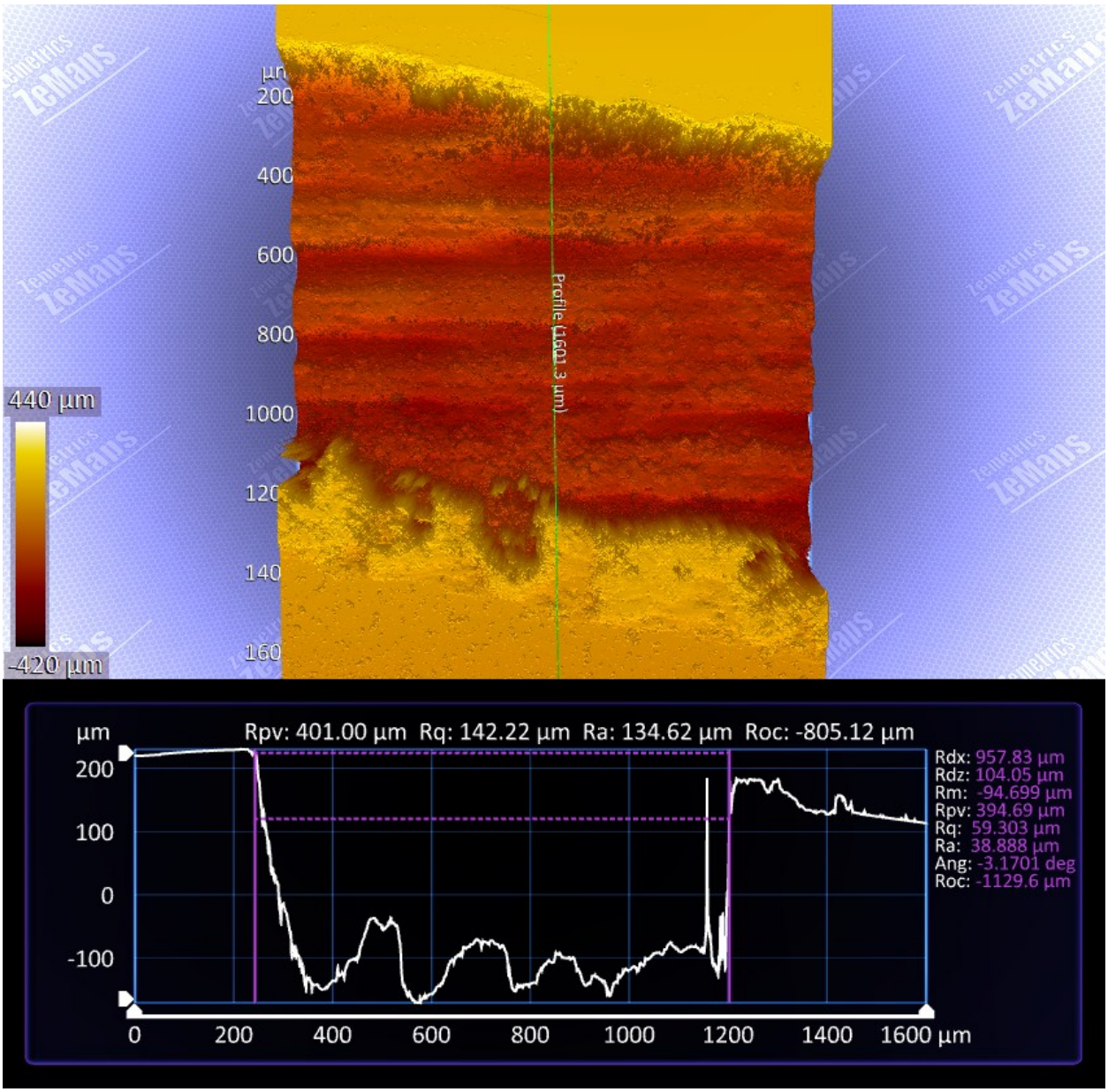

Figure S7 optical profilometry of a channel cut into a droplet generator of a single pass in the Y-axis of the laser cutter. Image is of the waste zone of the droplet generator.

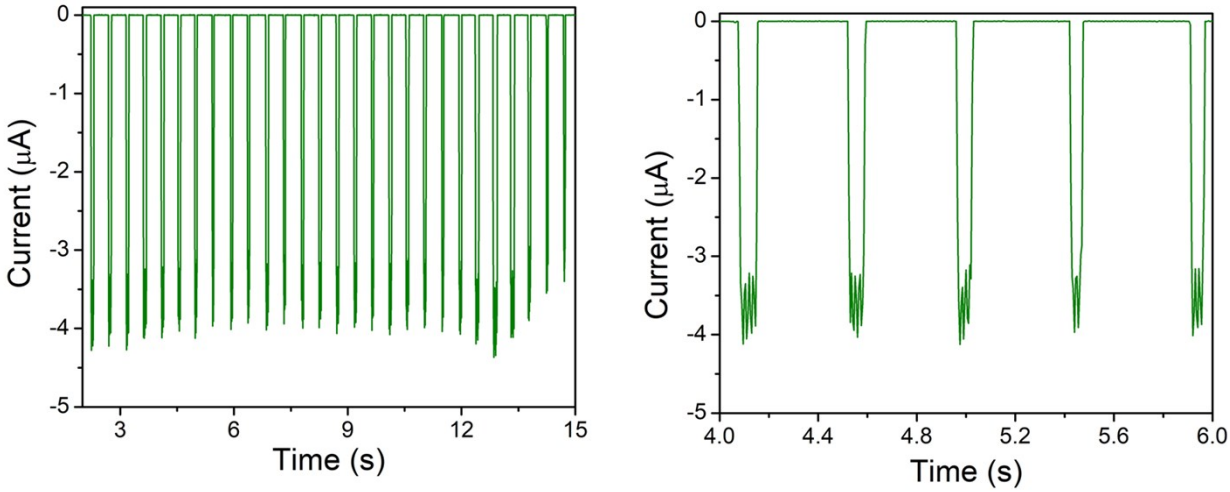

Figure S8 Droplet generation in a salinized microfluidic chip, demonstration of short term stability for the sending of water droplets. Droplets contained 1 mM of ferricyanide in0.5 M KCl..

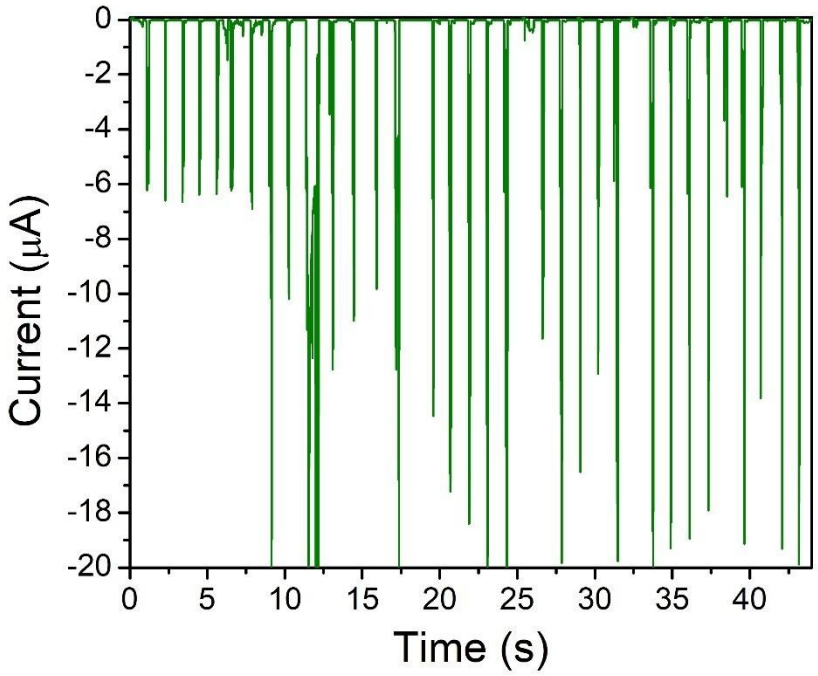

Figure S9 Droplet generation in a salinized microfluidic chip, demonstrating instabilities in droplet sensing in a second run. Droplets contained 1 mM of ferricyanide in 0.5 M KCl.