**Supplementary material**

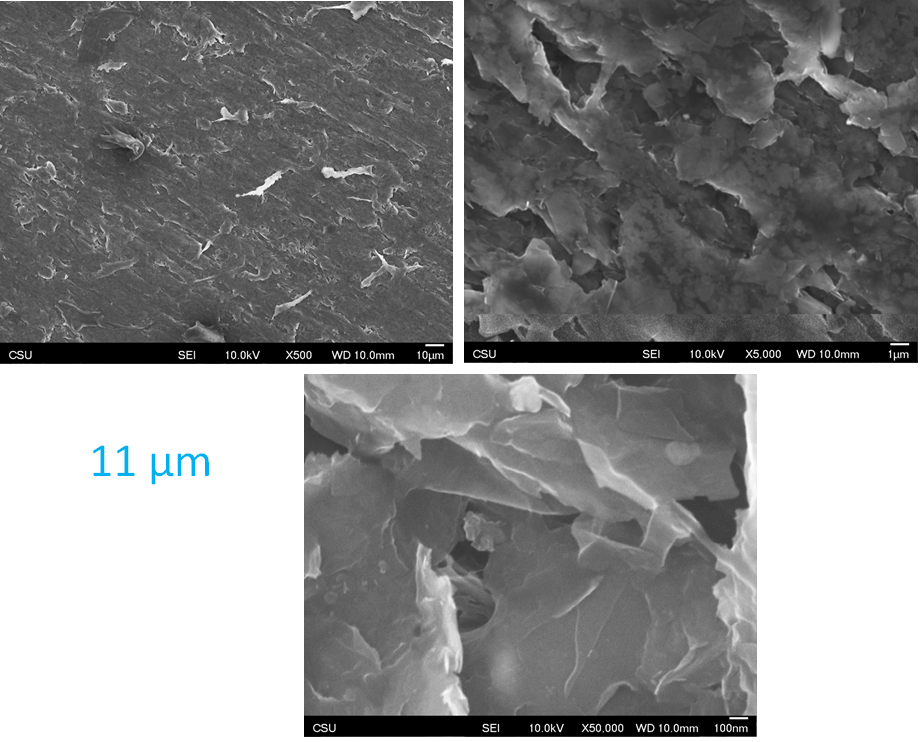
**Polycaprolactone enabled sealing and carbon composite electrode integration into electrochemical microfluidics**

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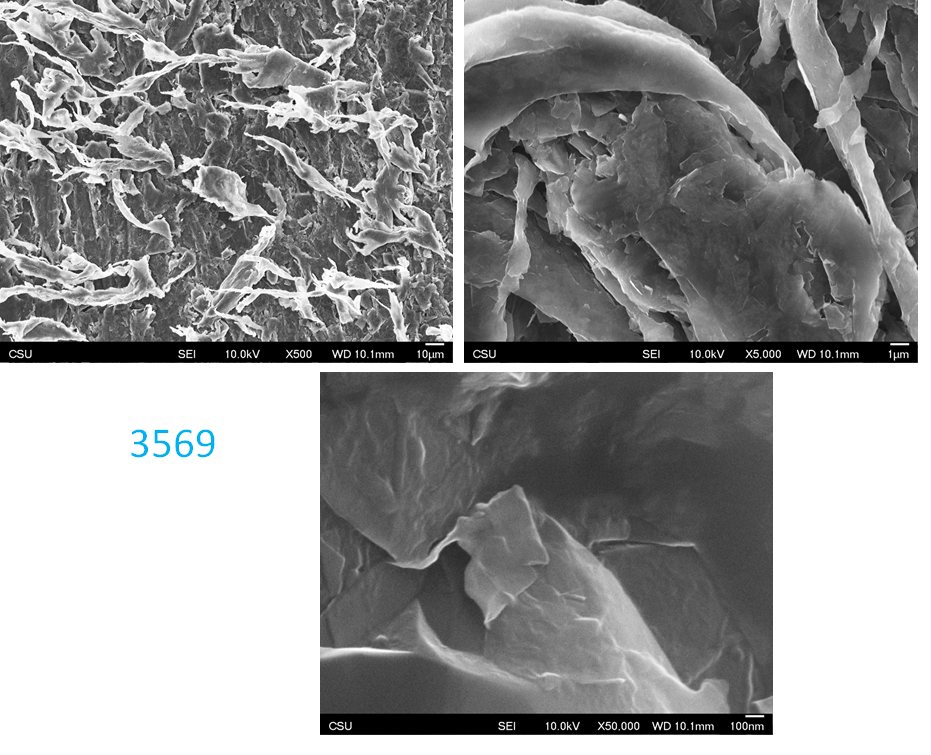
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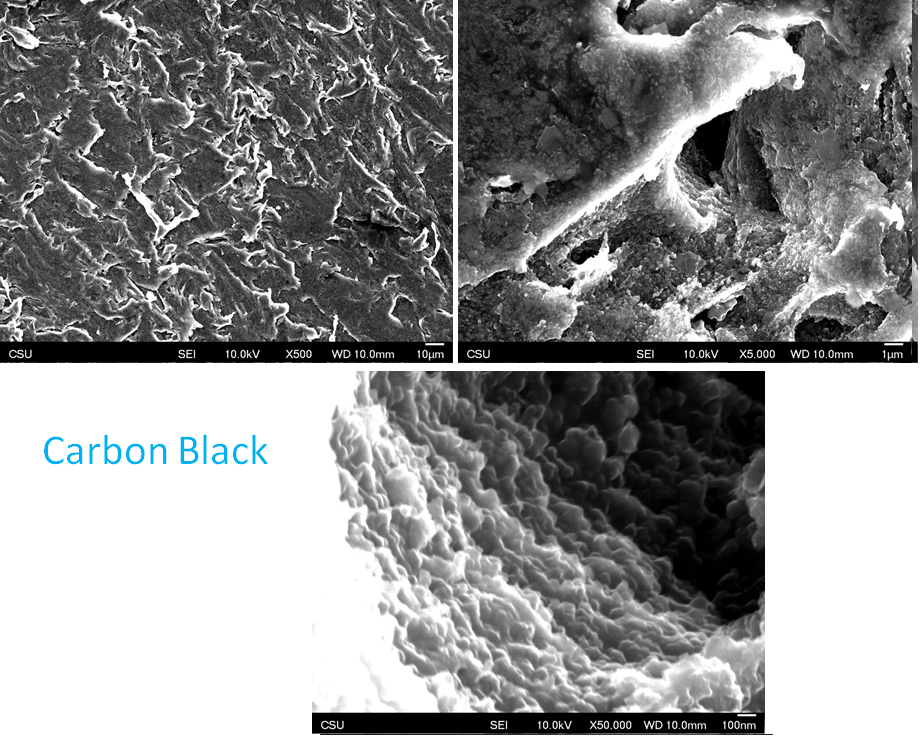
\*Corresponding author



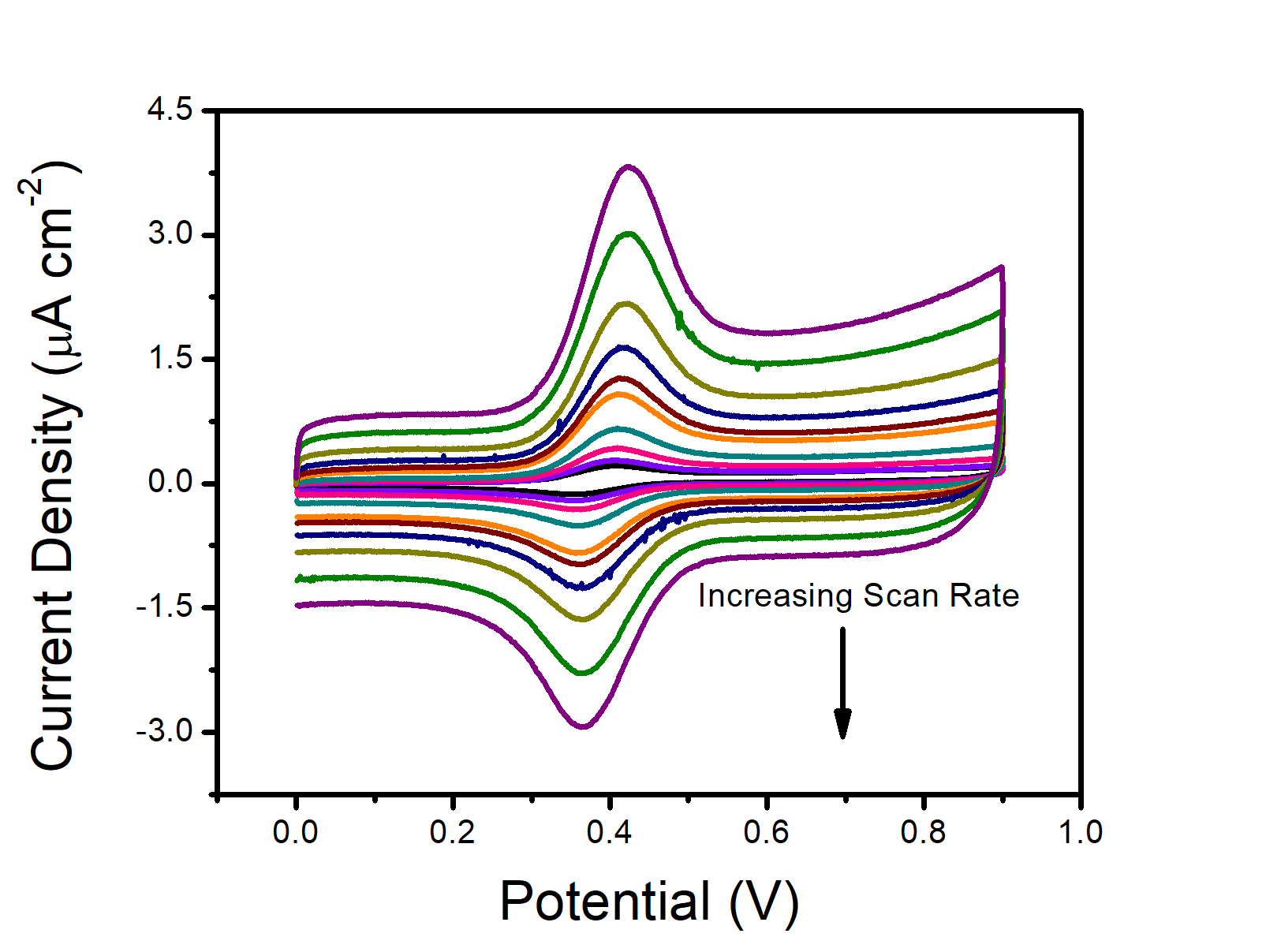
**Figure S1** SEM images of a 1:2 11 µm electrode



**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)**V** | **ΔE (**ΔE (mV)**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 KNO3, error from standard deviation of 3 different electrodes.

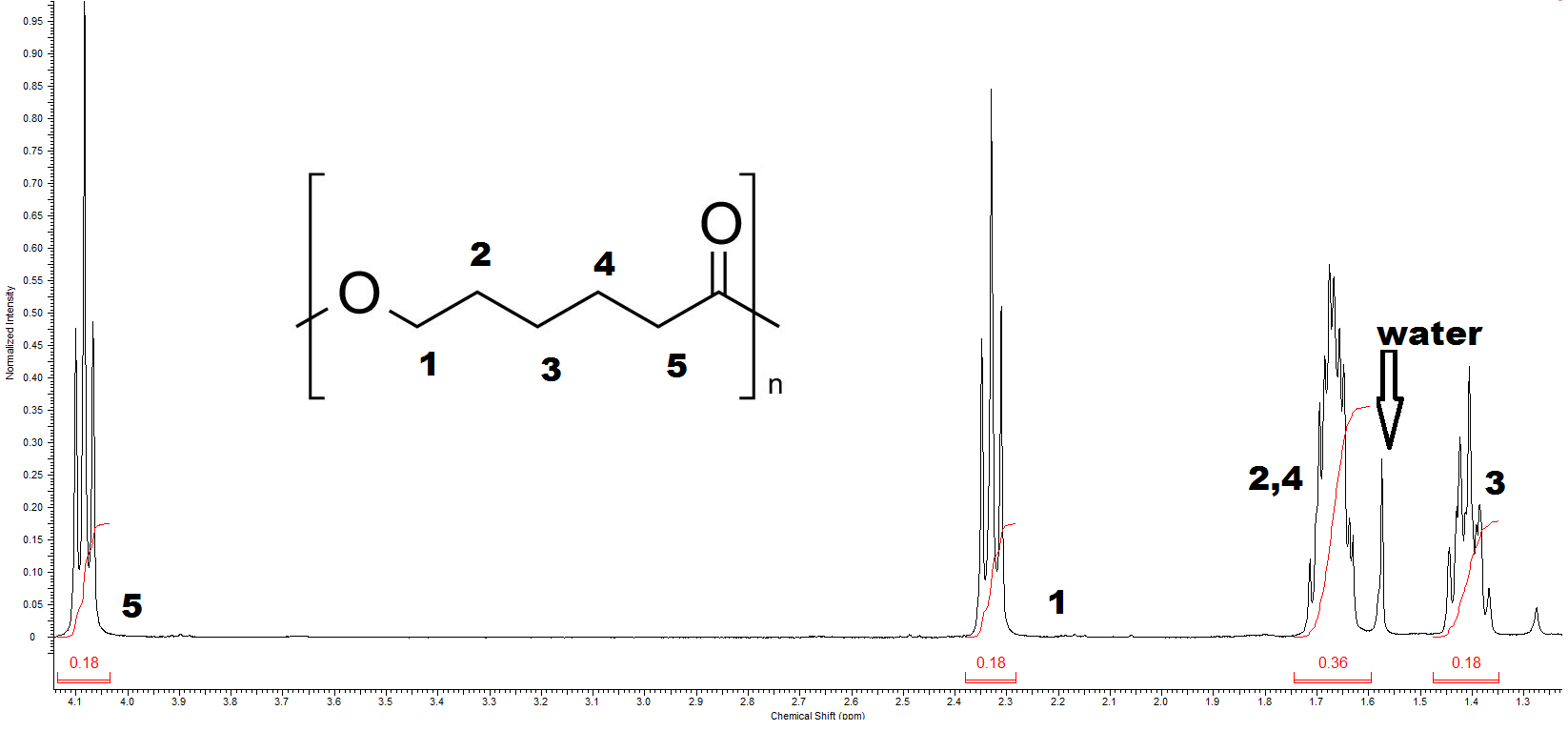
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Scan Rate (mV/s) | **ΔE (**ΔE (mV)**mV)** | | | | | |
|  | 1:2  PCL:11 micron | 1:4  PCL:11 micron | 1:2  PCL:3569 | 1:4  PCL:3569 | 1:2  PCL:MG-1599 | 1:4  PCL:MG-1599 |
| 25 | 72 ± 5 | 74 ± 4 | 77 ± 7 | 69 ± 2 | 75 ± 2 | 75 ± 7 |
| 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 KNO3, error from standard deviation of 3 different electrodes.

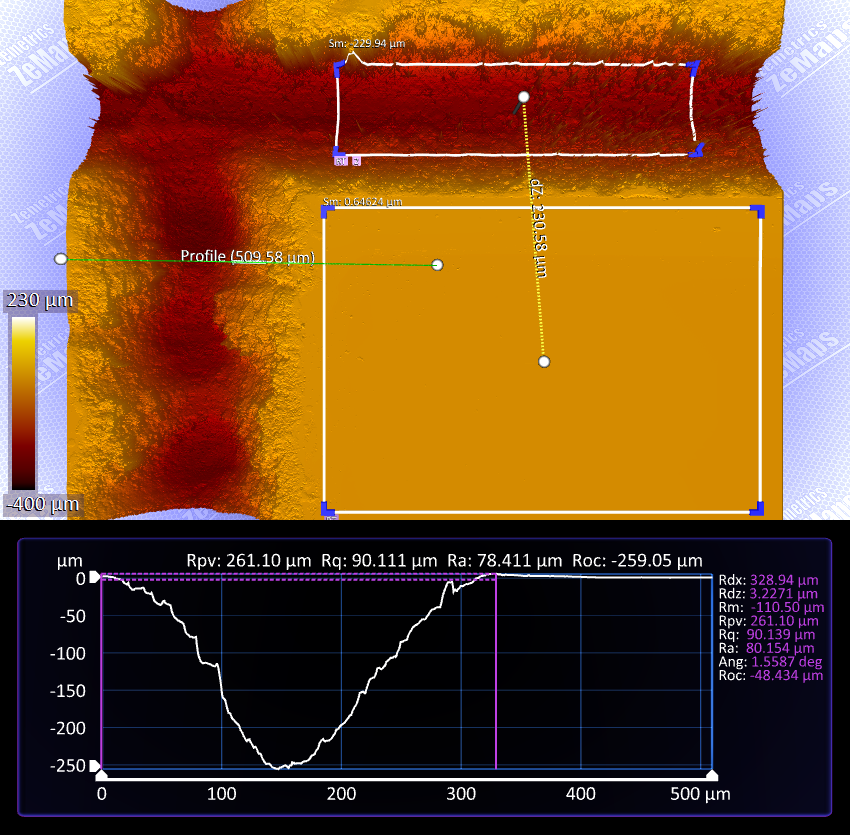
The heterogeneous electron transfer rate constants (k0) were calculated using the Nicholson method.40 The following equation was used:

ψ = k0[πDnF*v*/RT]-1/2

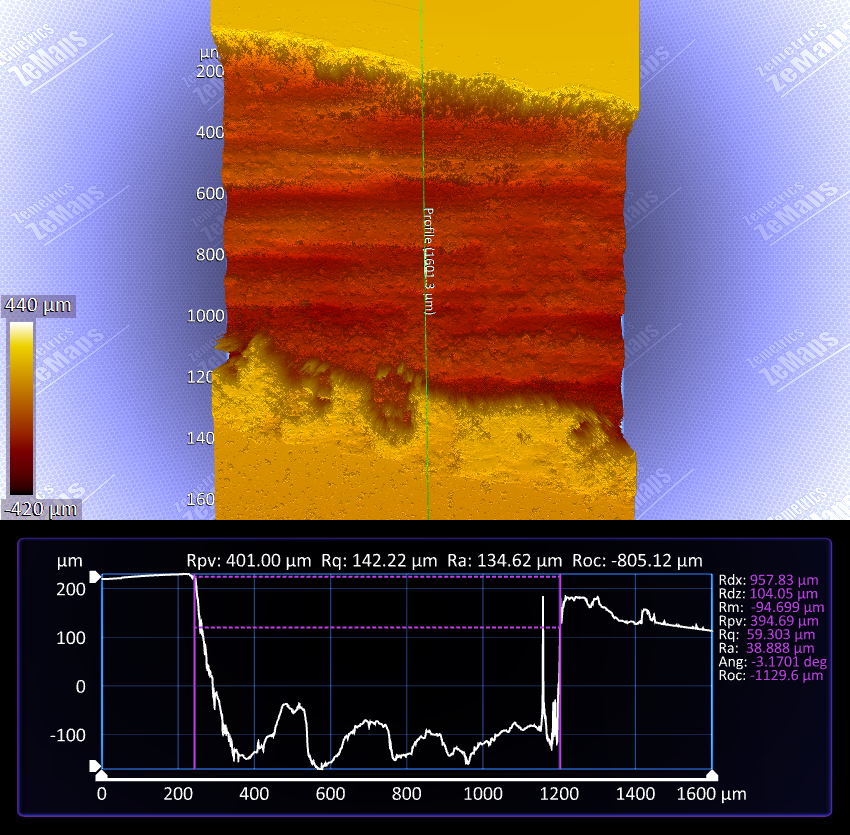
The kinetic parameters (ψ) from the average ∆Es of the ferri/ferrocyanide peaks for each scan rate were plotted versus [πDnF*v*/RT]-1/2 where D is the diffusion coefficient, F is Farady’s constant, *v* is the scan rate, R is the ideal gas constant, and T is temperature. The rate constants were determined from the slopes of the regression lines and the error shown is the standard error of the slope.



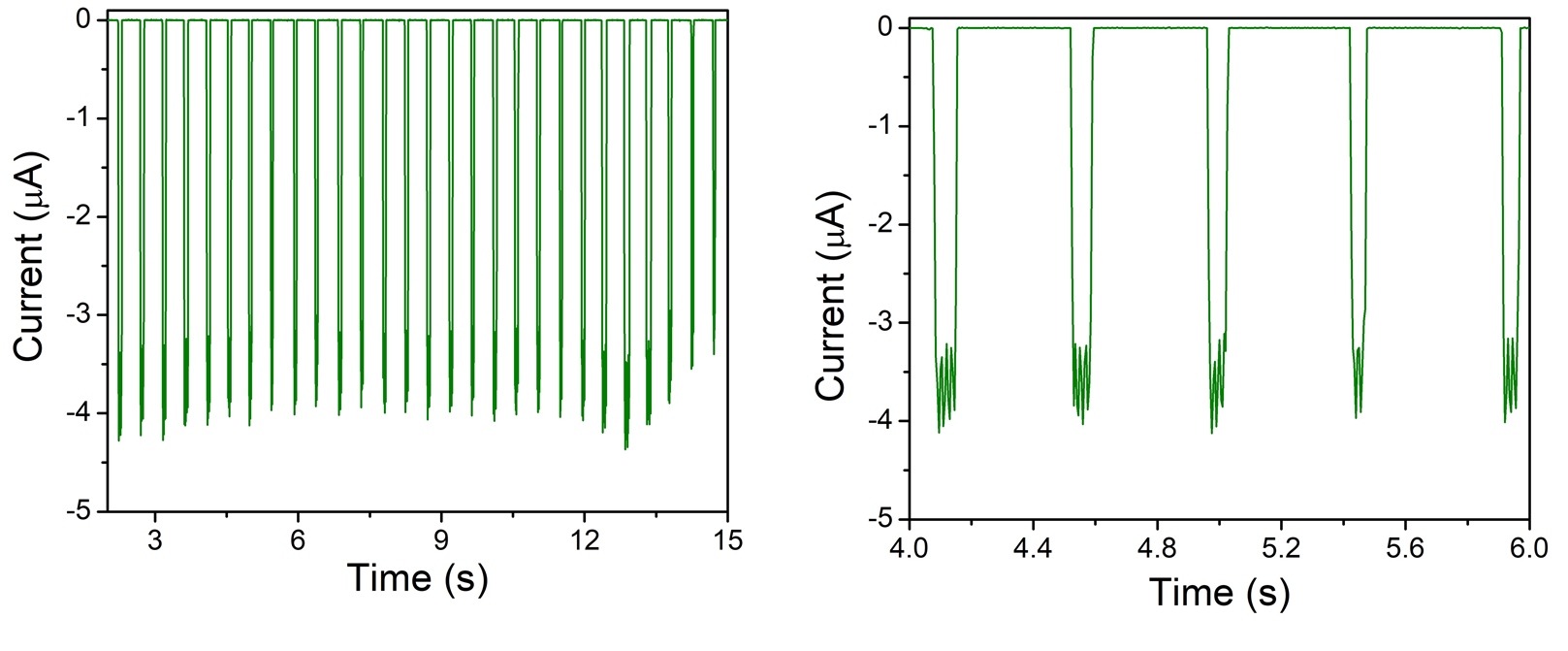
**Figure S5** 1H-NMR spectra of ThermoMorph polymer in CDCl3.



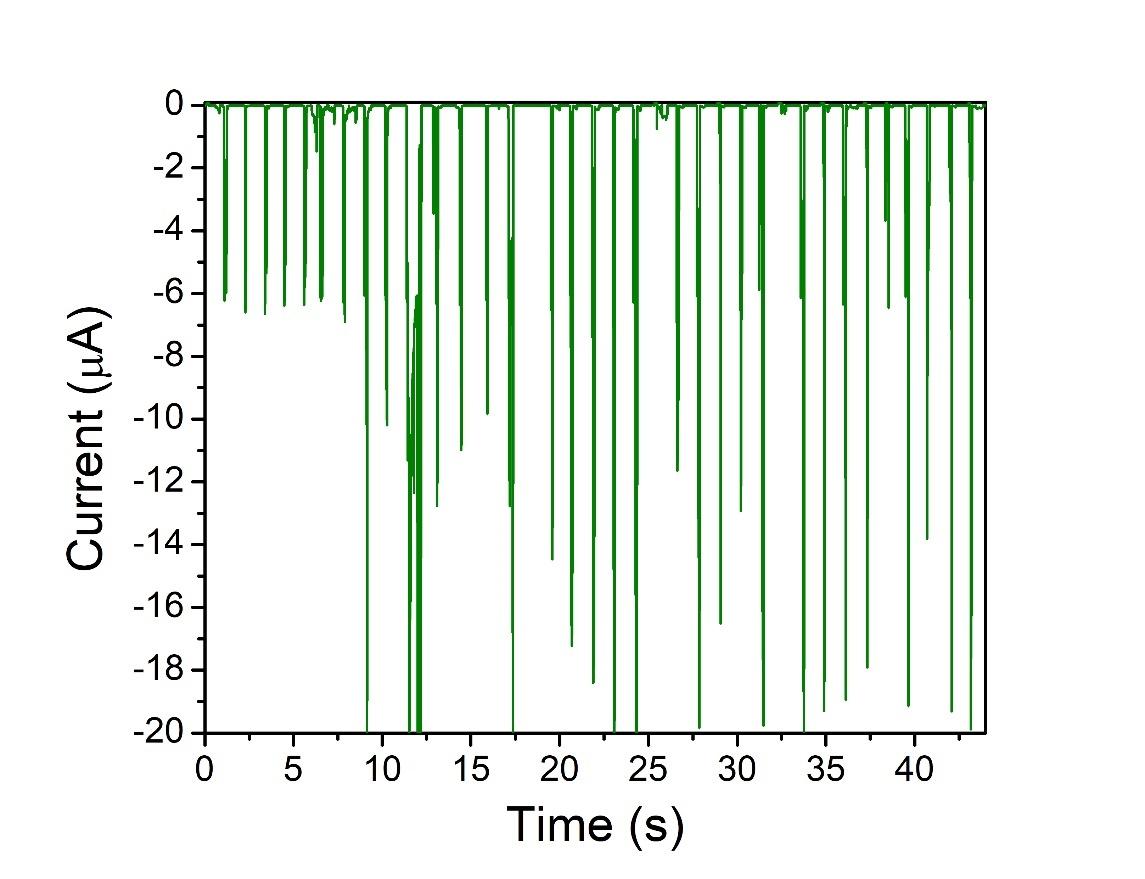
**Figure S6** Optical profilometry of a channel cut into a droplet generator of a single pass in the X-axis of the laser cutter.



**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.