Supplementary Information

Isa Anshori [1,2,*], Kurniati Laeli Munifah [1], Eduardus Ariasena [1], Muhammad Azhar Faiq [1], Lavita Nuraviana Rizalputri [1,2], Suksmandhira Harimurti [1], Tati Latifah Erawati Rajab [1,*], Mohammad Rizki Akbar [3], Murni Handayani [4], Agnes Purwidyantri [4,5] and Briliant Adhi Prabowo [4,6,7*]

[1] Biomedical Engineering Department, School of Electrical Engineering and Informatics, Bandung Institute of Technology, Bandung 40132, Indonesia;

[2] Research Center for Nanosciences and Nanotechnology (RCNN), Bandung Institute of Technology, Bandung 40132, Indonesia;

[3] Department of Cardiology and Vascular Medicine, Faculty of Medicine, Universitas Padjadjaran and Dr. Hasan Sadikin General Hospital, Bandung 40161, Indonesia;

[4] National Research and Innovation Agency (BRIN), Tangerang Selatan 15314, Indonesia;

[5] School of Chemistry and Chemical Engineering, Queen's University Belfast, Belfast BT9 5AG, United Kingdom

[6] International Iberian Nanotechnology Laboratory (INL), Braga 4715-330, Portugal;

[7] School of Mathematics and Physics, Queen's University Belfast, Belfast BT1 7NN, United Kingdom;

***** Correspondence: isaa@staff.stei.itb.ac.id (I.A.); briliant.prabowo@inl.int (B.A.P.)

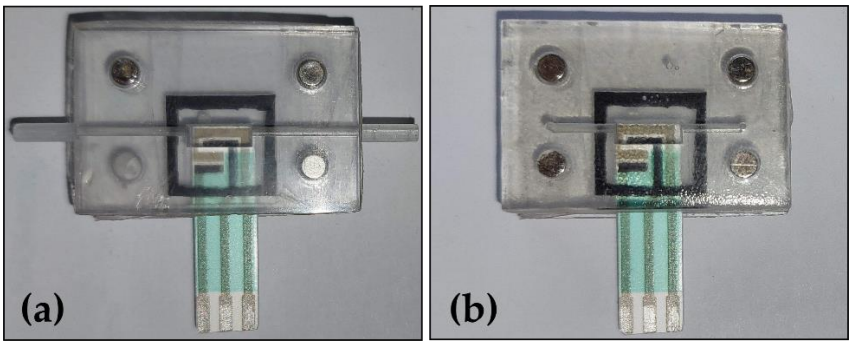

Figure S1. The integration of SPCE into the fundamental block of the (**a**) TFC and (**b**) SFC microfluidic platform using magnets as the adhesive and gasket to prevent the sample leakage out of the platform.

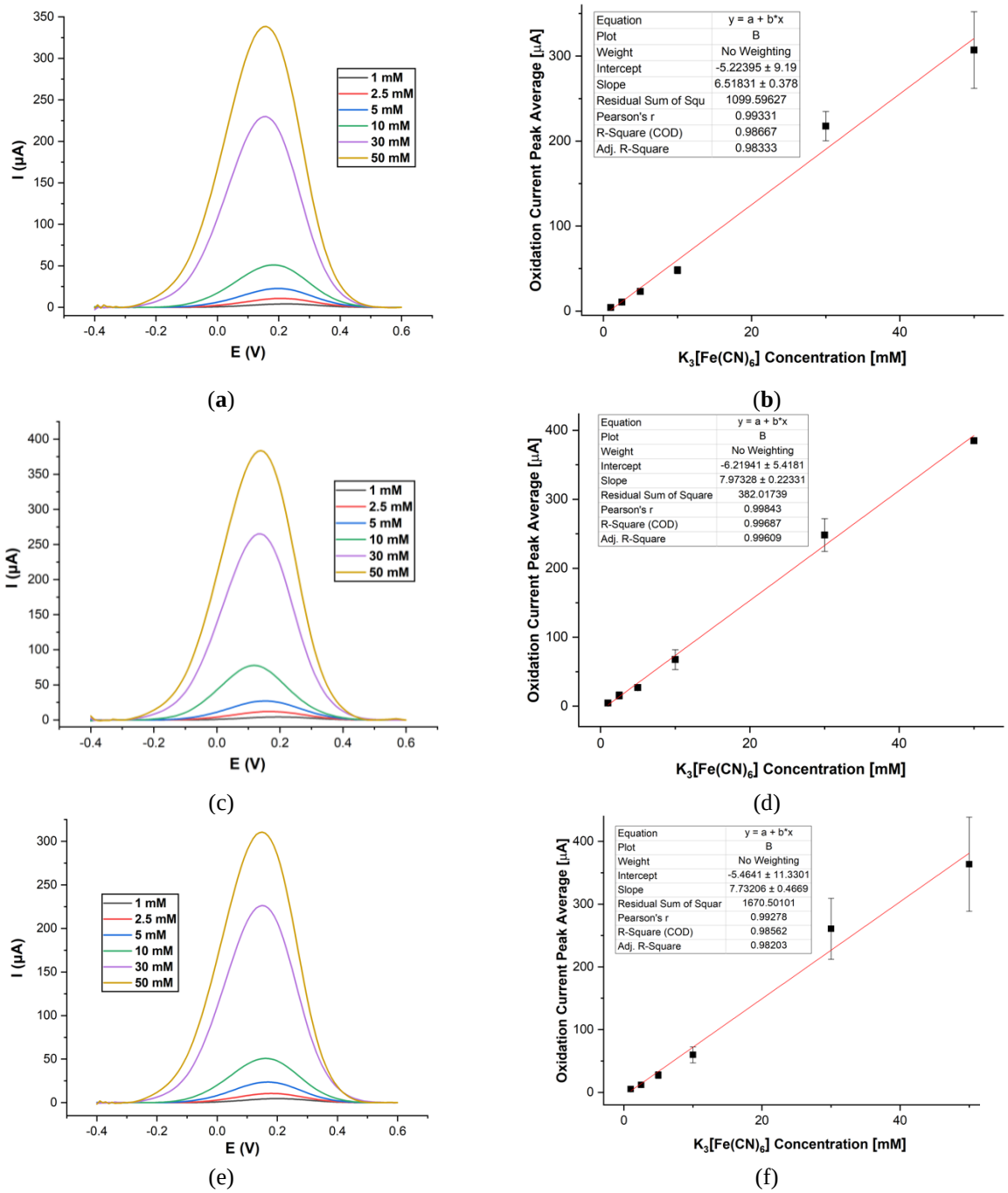

Figure S2. Pulse voltammetry testing of $K_3[Fe(CN)_6]$ with different concentrations using 50 µL droplet sample on the surface of SPCE (a and b), TFC flow cell (c and d), and SFC flow cell (e and f): (**a, c, e**) Differential pulse voltammograms at several $K_3[Fe(CN)_6]$ concentrations; (**b, d, f**) Linear regression and calibrations plots of oxidation current peak average vs. $K_3[Fe(CN)_6]$ concentrations. The calibration plots in (b, d, f) show a linear relation between K3[Fe(CN)6] concentration and the oxidation current peak average of the DPV detection with R2 (coefficient of determination) values of 0.9867, 0.9969, 0.9856, respectively. The sensitivity of the detection based on the slope of the calibration plot is 6.5183 ± 0.3789, 7.9733 ± 0.2233, and 7.7321 ± 0.4670 µA/mM for droplet, TFC, and SFC scenarios, respectively.

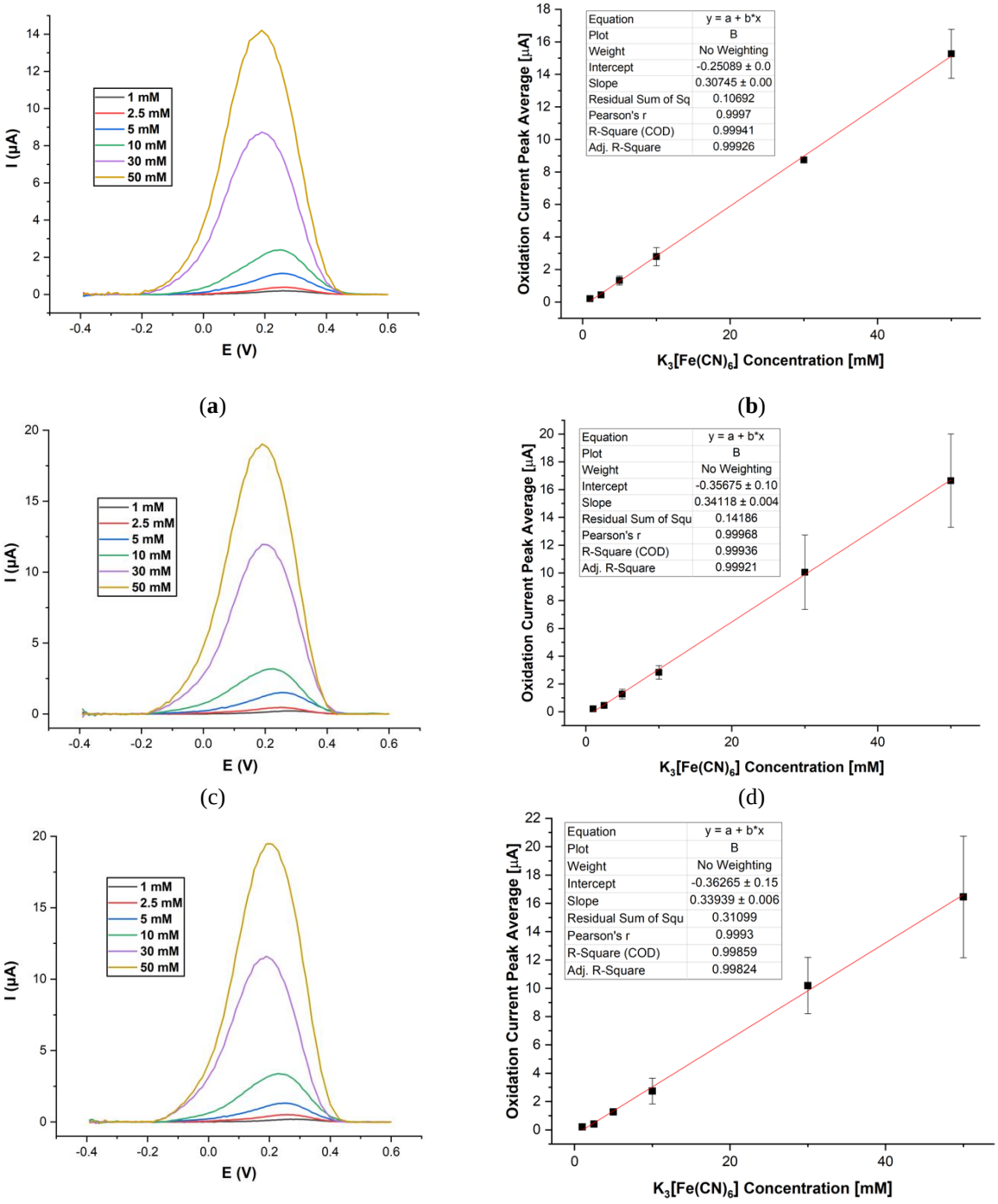

Figure S3. Square wave voltammetry testing of $K_3[Fe(CN)_6$ with different concentrations using 50 µl droplet sample on the surface of SPCE (a and b), TFC flow cell (c and d), and SFC flow cell (e and f): (**a, c, e**) Differential pulse voltammograms at several $K_3[Fe(CN)_6]$ concentrations; (**b, d, f**) Linear regression and calibrations plots of oxidation current peak average vs. $K_3[Fe(CN)_6]$ concentrations. The calibration plots in (b, d, f) show a linear relation between K3[Fe(CN)6] concentration and the oxidation current peak average of the SWV detection with R2 (coefficient of determination) values of 0.9994, 0.9994, 0.9986, respectively. The sensitivity of the detection based on the slope of the calibration plot is 0.3075 ± 0.0037, 0.3412 ± 0.0043, and 0.3394 ± 0.0064 µA/mM for droplet, TFC, and SFC scenario respectively.

Table S1. Oxidation current peak comparison of concentration-varied cyclic voltammetry test obtained from droplet-based, TFC, and SFC platforms.

Cyclic voltammetry for different concentrations					
$K_3[Fe(CN)_6]$ concentration (mM)	Oxidation current peak average				
	Droplet (Control)	TFC		SFC	
	Value (µA)	Value (µA)	Improvement from control (%)	Value(µA)	Improvement from control (%)
1	2.62	2.74	4.53	2.85	8.85
2.5	6.53	6.35	2.85	6.67	2.02
5	13.92	14.82	6.43	15.11	8.51
10	30.74	32.49	5.70	32.72	6.45
30	120.19	128.64	7.03	128.58	6.98
50	187.03	196.26	4.94	196.83	5.24
		Average	5.25	**Average**	6.34

Table S2. Oxidation current peak comparison of concentration-varied DPV of droplet-based, TFC, and SFC-based platforms.

Differential pulse voltammetry (concentration-varied)					
$K_3[Fe(CN)_6]$ concentration (mM)	Oxidation current peak average				
	Droplet (Control)	TFC		SFC	
	Value (µA)	Value (µA)	Improvement from control (%)	Value (µA)	Improvement from control (%)
1	4.21	4.58	8.76	5.21	23.67
2.5	10.50	15.74	50.02	11.94	13.76
5	23.13	26.95	16.53	27.55	19.11
10	48.17	67.53	40.19	59.77	24.08
30	217.67	248.26	14.06	260.75	19.79
50	307.04	384.98	25.39	363.61	18.42
		Average	25.82	**Average**	19.81

Table S3. Oxidation current peak comparison of concentration-varied SWV of droplet-based, TFC, and SFC-based platforms.

Square wave voltammetry (concentration-varied)					
$K_3[Fe(CN)_6]$ concentration (mM)	Oxidation Current Peak Average				
	Droplet (Control)	TFC		SFC	
	Value (μA)	Value (μA)	Improvement from control (%)	Value (μA)	Improvement from control (%)
1	0.21	0.21	0.01	0.21	2.60
2.5	0.44	0.45	0.94	0.41	7.73
5	1.33	1.27	4.24	1.26	4.90
10	2.79	2.84	1.52	2.74	1.97
30	8.74	10.05	15.03	10.19	16.59
50	15.26	16.65	9.06	16.45	7.77
		Average	5.13	**Average**	6.93