

Supplementary Information

Reagents

Glass slides (75×50×1 mm) were obtained from Corning Inc. (Corning, NY). SPR220-7 was obtained from MicroChem(Westborough, MA). MF-CD26 developer was obtained from Rohm and Haas Electronic Materials (Marlborough, MA). FC-70 (a mixture of perfluoro-tri-*n*-butylamine and perfluoro-di-*n*-butylmethylamine) was purchased from Hampton Research (Aliso Viejo, CA). Tridecafluoro-1,1,2,2-tetrahydrooctyl-1-trichlorosilane was obtained from Pfaltz and Bauer (Waterbury, CT). Phosphate-buffered saline (PBS) (, pH7.4) was obtained from Lonza (Allendale, NJ). Bovine serum albumin (BSA), Chloroplatinicacidhexahydrate ($\text{H}_2\text{PtCl}_6 \cdot \text{H}_2\text{O}$), sodium citrate, (3-glycidoxypropyl) trimethoxysilane (3-GPS),hydrogen peroxide (H_2O_2) solution (35%in H_2O), NH_4F , HF, and HNO_3 were obtained from Sigma-Aldrich(St. Louis, MO). Red ink was purchased from Fisher Scientific and diluted by a factor of 10before use. Polyvinyl chloride sealing tape was obtained from 3M (St. Paul, MN). Amorphous diamond-coated drill bits (0.031-inch cutter diameter) were purchased from Harvey Tool (Rowley, MA). Antibodies against creatine kinase (CK)-MB, troponin I, myoglobin, and associated proteins were obtained from Abcam (Cambridge, UK).

Supplementary Figures

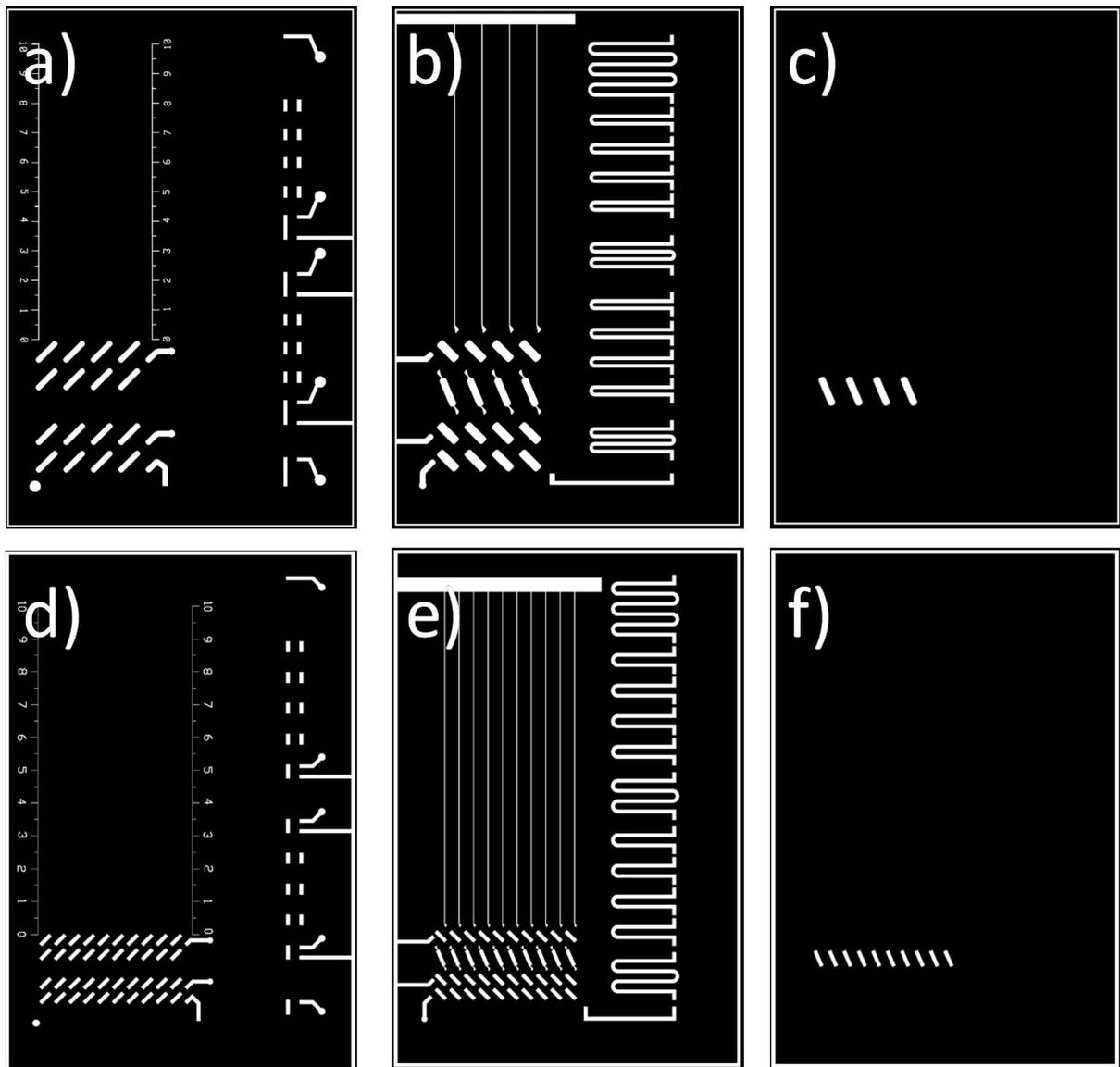


Fig. S1. Masks used for fabrication of 4-plex IV-Chip (a) Top plate, (b) bottom plate, and (c) platinum film; 10-plex IV-Chip (d) Top plate, (e) bottom plate, and (f) platinum film.

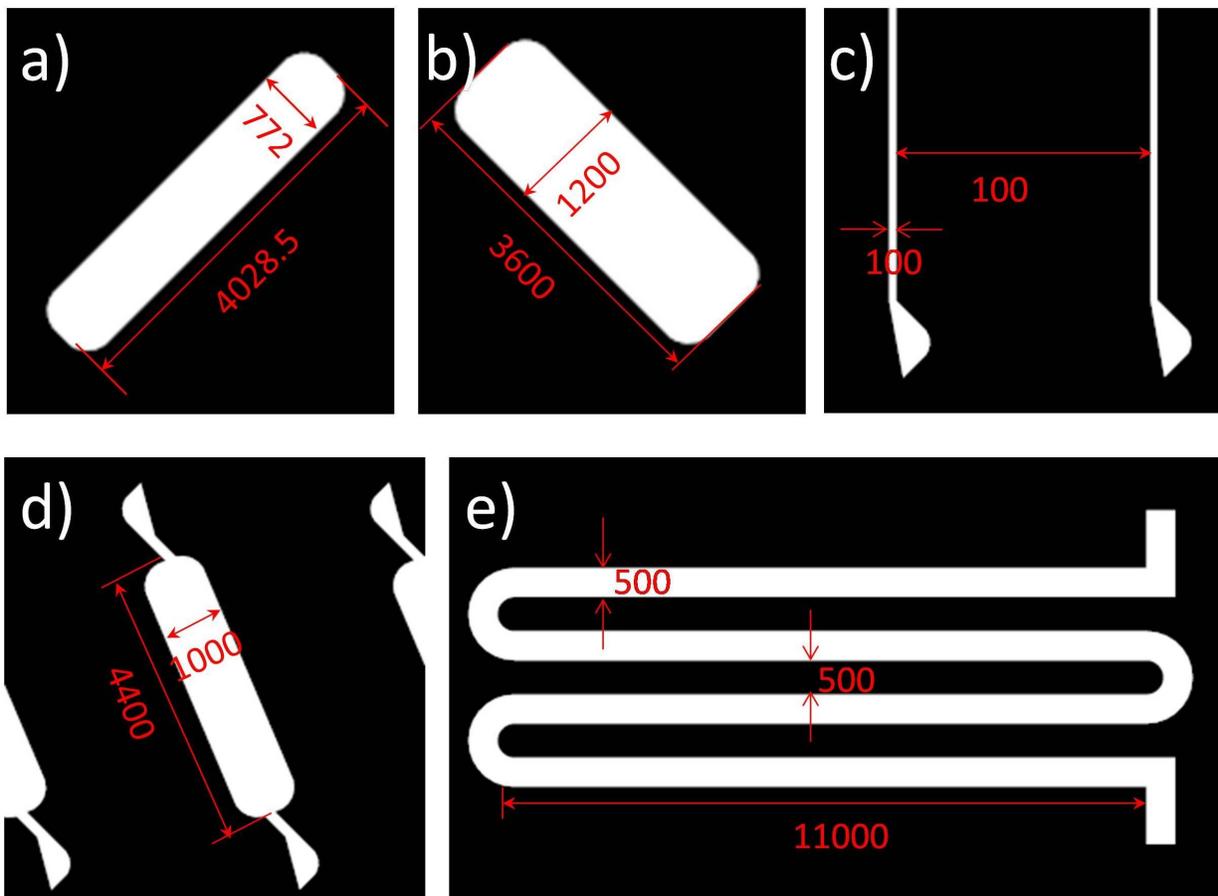


Fig. S2.Dimensions of each unit in the masks for 4-plex IV-Chip fabrication (a) top well, (b) bottom well, (c) detection channel, (d) platinum well and (e) plug channel..

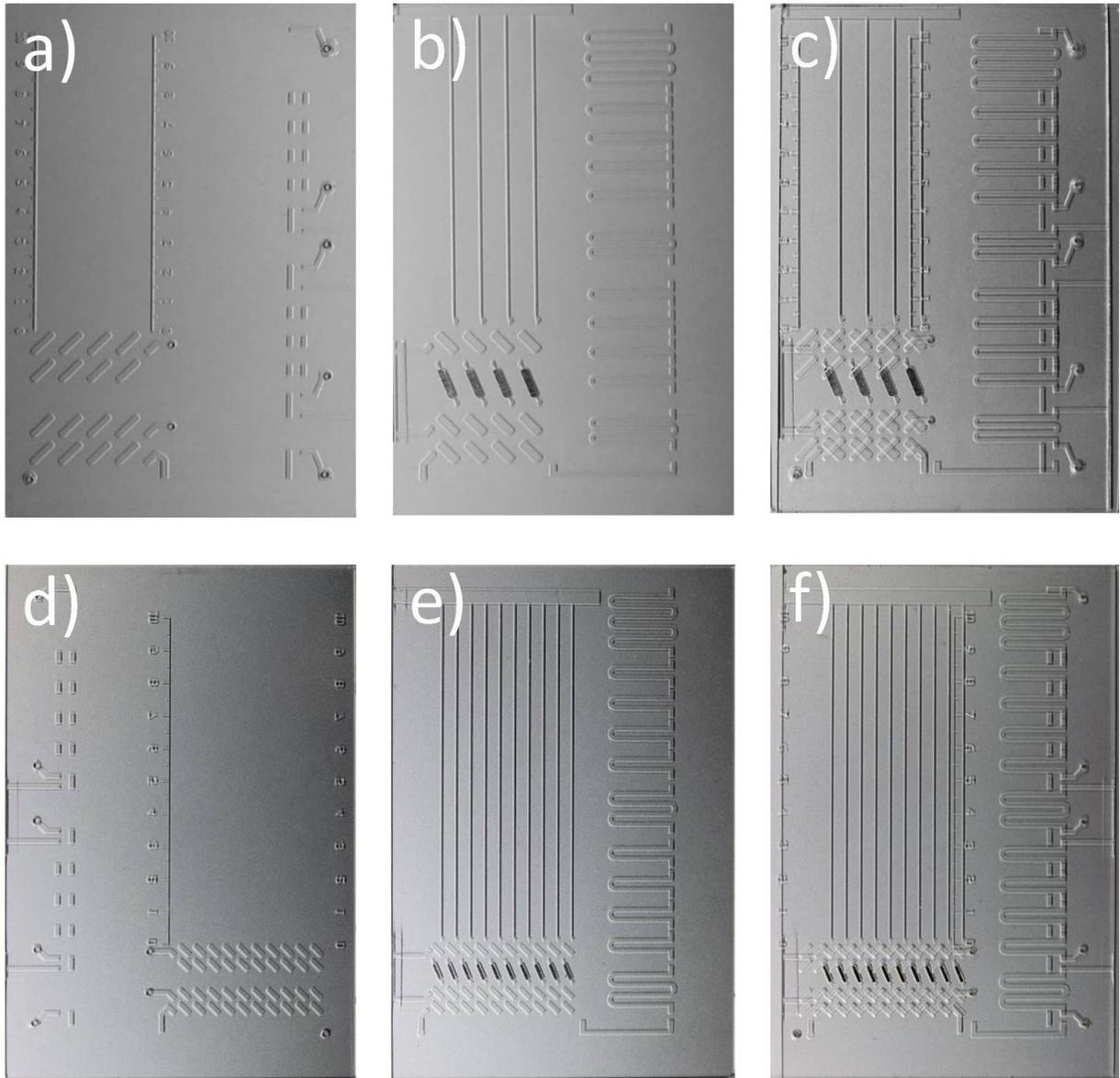


Fig. S3. Photographs for 4-plex IV-Chip: (a) top plate, (b) bottom plate, and (c) assembled 4-plex IV-Chip.; 10-plex IV-Chip: (d) top plate, (e) bottom plate and (f) assembled 10-plex IV-Chip.

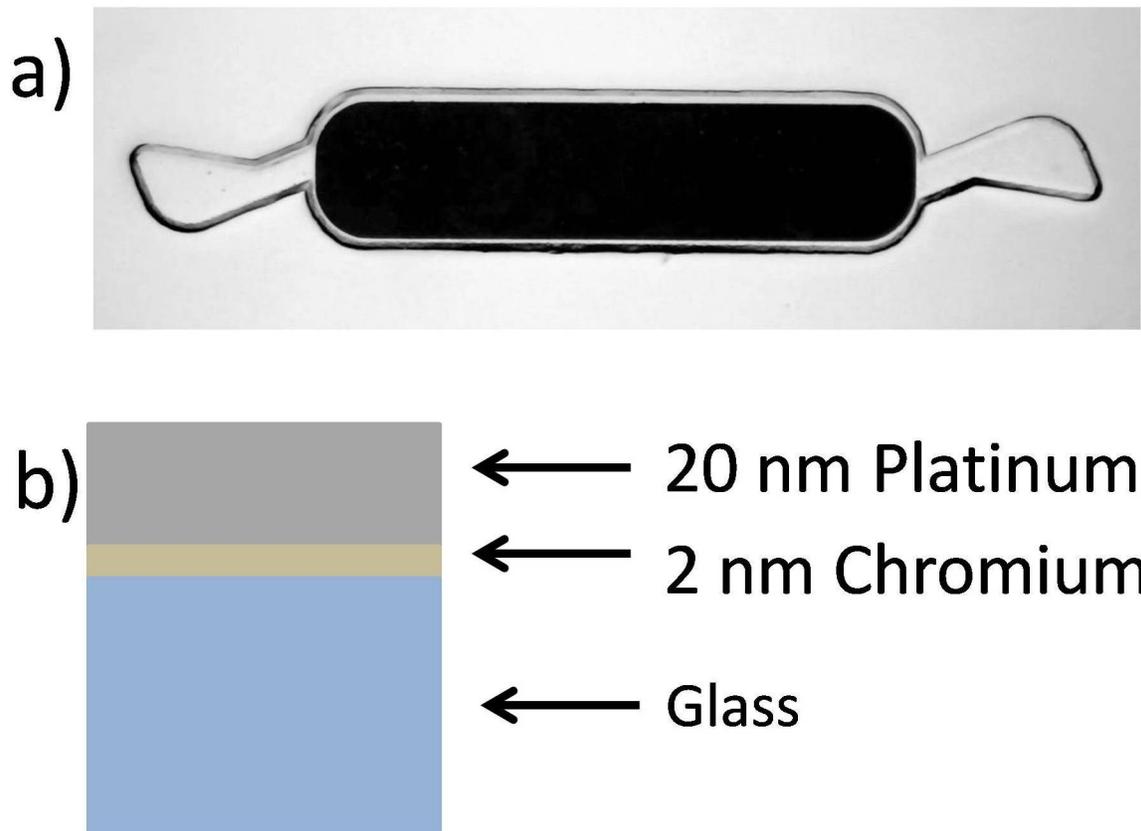


Fig. S4.(a) Platinum/palladium film deposited in the wells of the third lane of the bottom plate.(b) The amounts of compound deposited in the well were 2 nm chromium and 20 nm platinum/palladium.

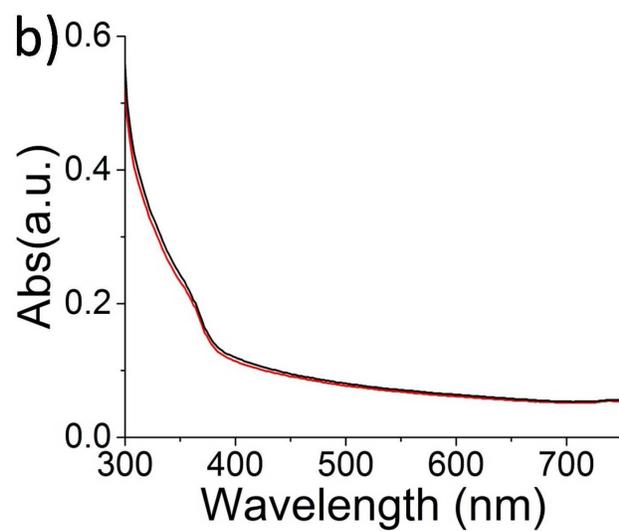
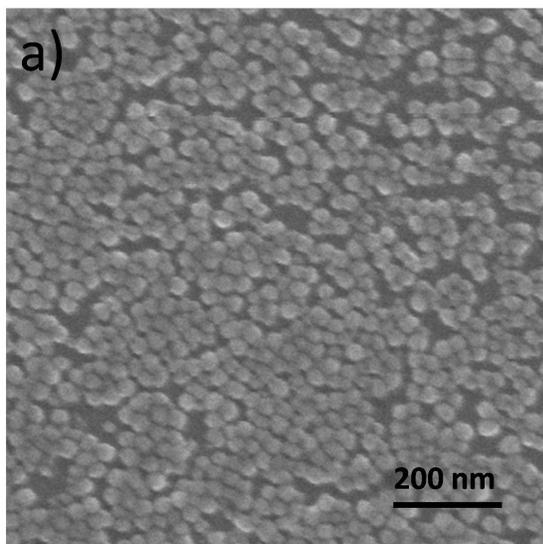


Fig. S5.(a) SEM image of PtNPs. (b) UV-vis spectra of PtNPs (black) and PtNP-antibody complexes (red).Abs, absorbance; a.u., arbitrary units.

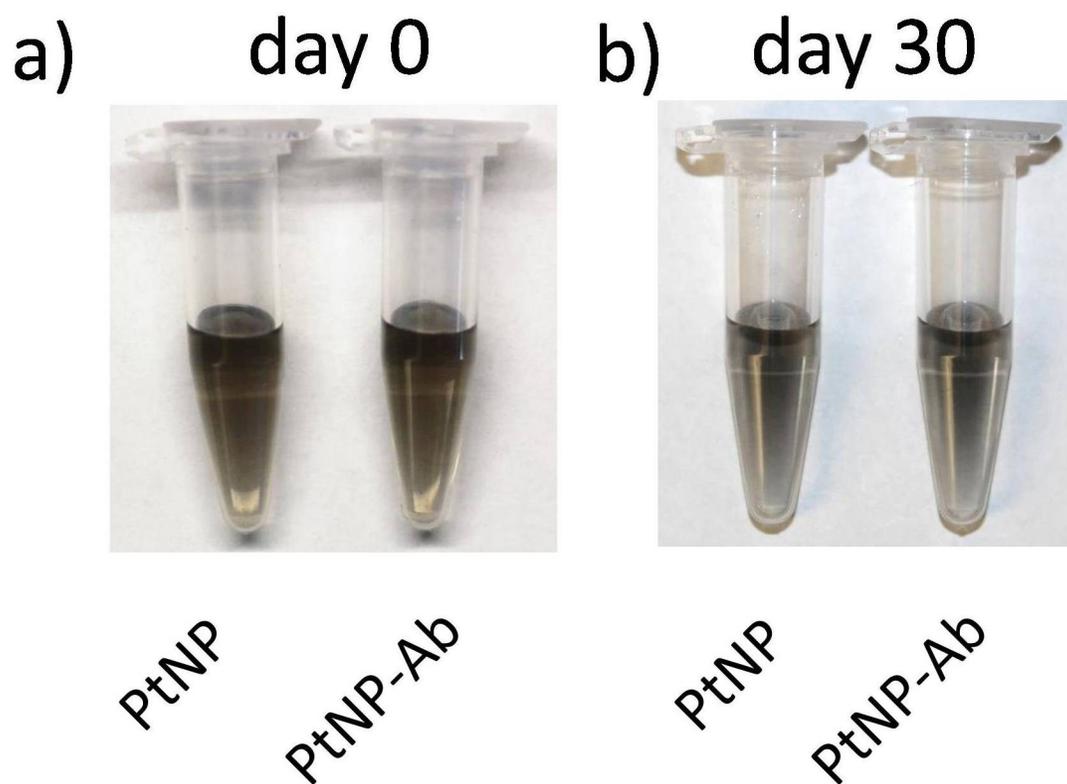


Fig. S6. Photographs of PtNP and PtNP-antibody (Ab) solutions on day 0 (a) and day 30 (b) of storage at 4 °C.

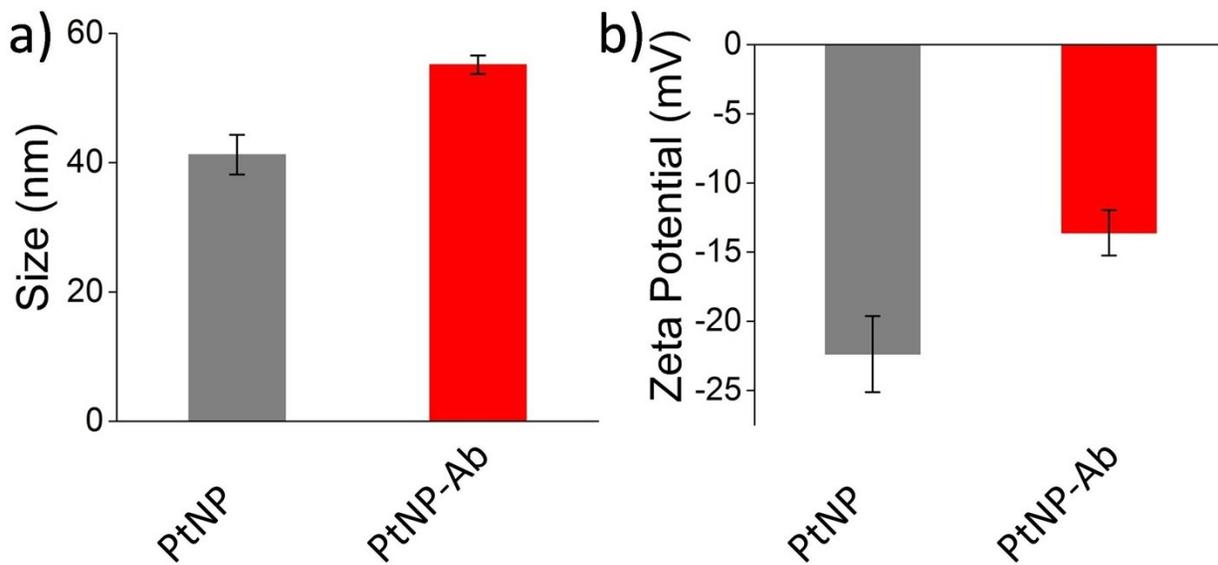


Fig. S7. (a) Size distribution of PtNPs and PtNP-Ab complexes determined by dynamic light scattering. (b) Zeta potential of PtNPs and PtNP-Ab complexes.

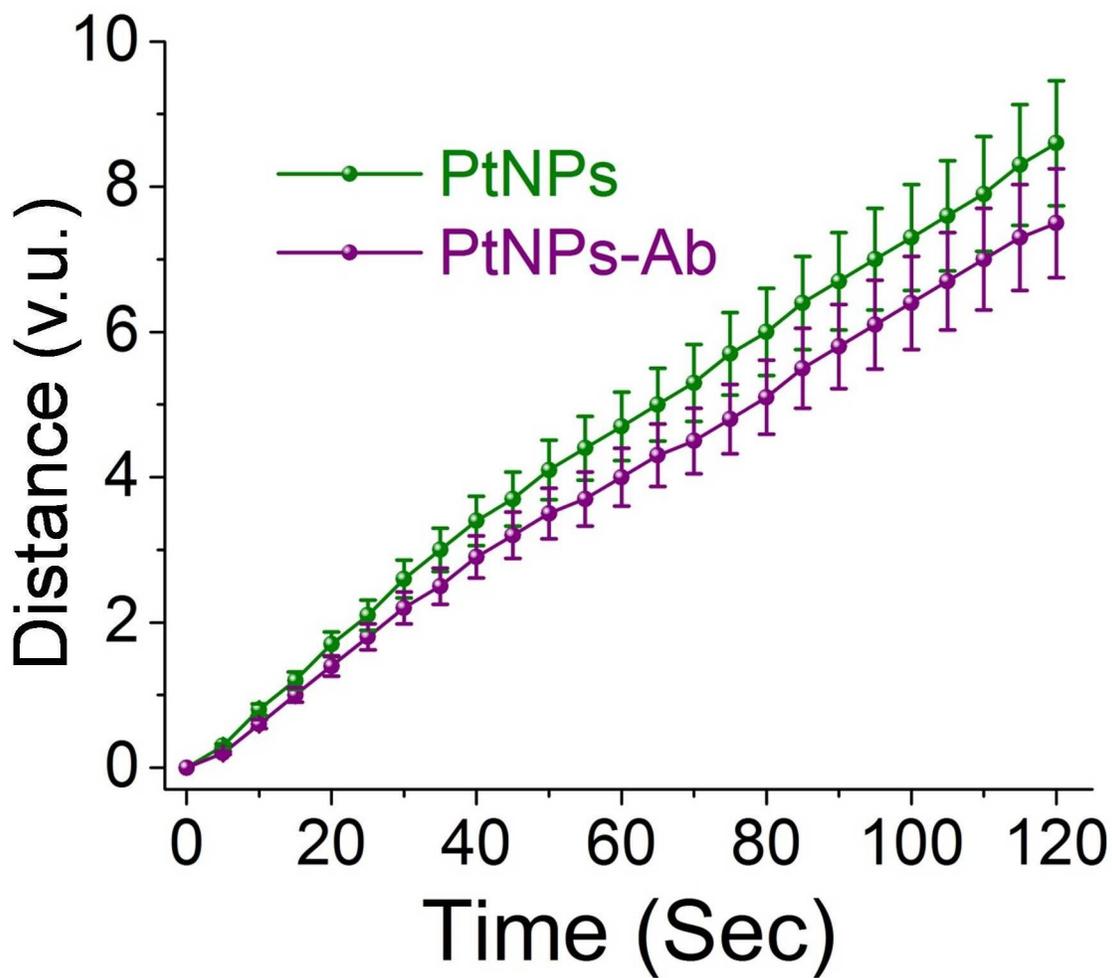


Fig. S8. Time-dependent change in distance traveled by ink in IV-Chip loaded with 5 ng mL^{-1} PtNP or PtNP-Ab solution on day 30 of storage. Values represent the mean \pm standard deviation of four independent experiments.

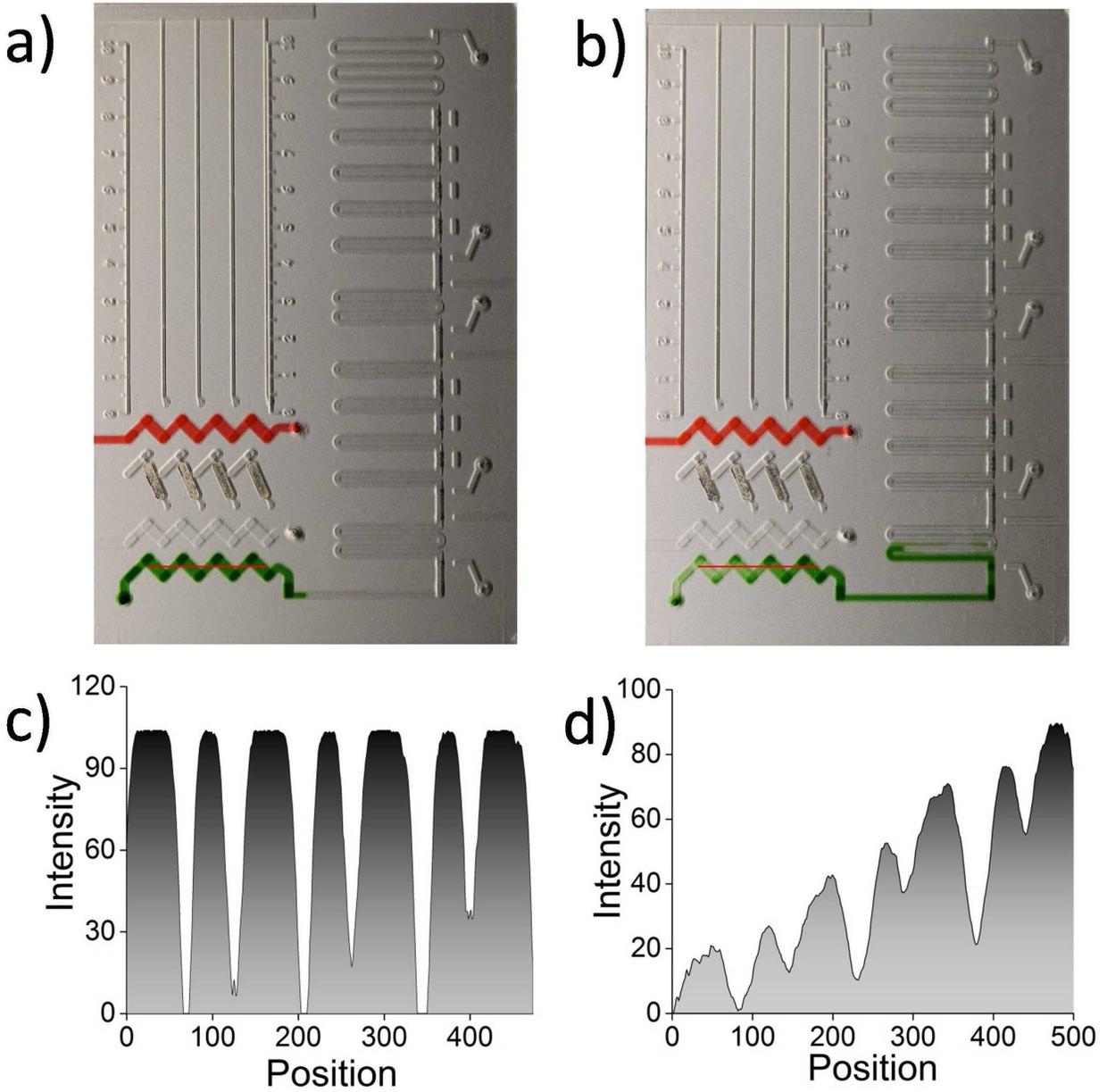


Fig. S9. Food dye loaded at the bottom left inlet so as to generate uniform concentration at indicated positions (a) or diffusing of water at the bottom left inlet to generate uniform gradual changes in concentration (b). (c, d) Intensity of the green color opposite corresponding point on red line in (a) and (b), respectively. The intensity was measured using image J.

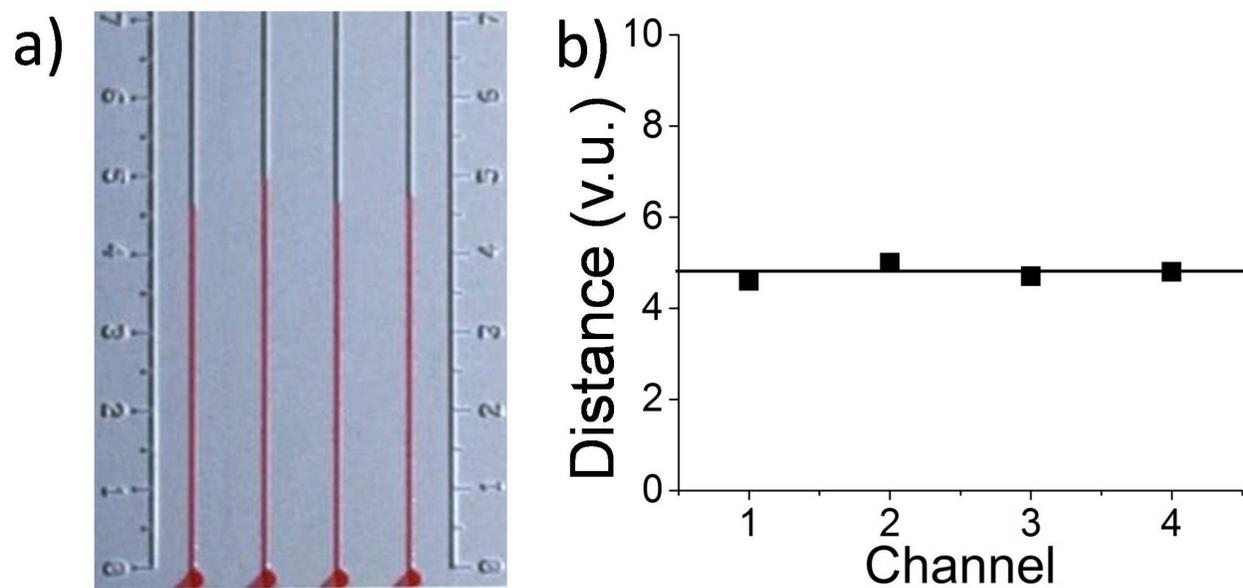


Fig. S10. (a, b) Uniform concentration of PtNPs (10 mgmL^{-1}) generates uniform bar-chart readout of distance traveled by red ink in the presence of 35% H_2O_2 , v.u., IV-Chip unit.

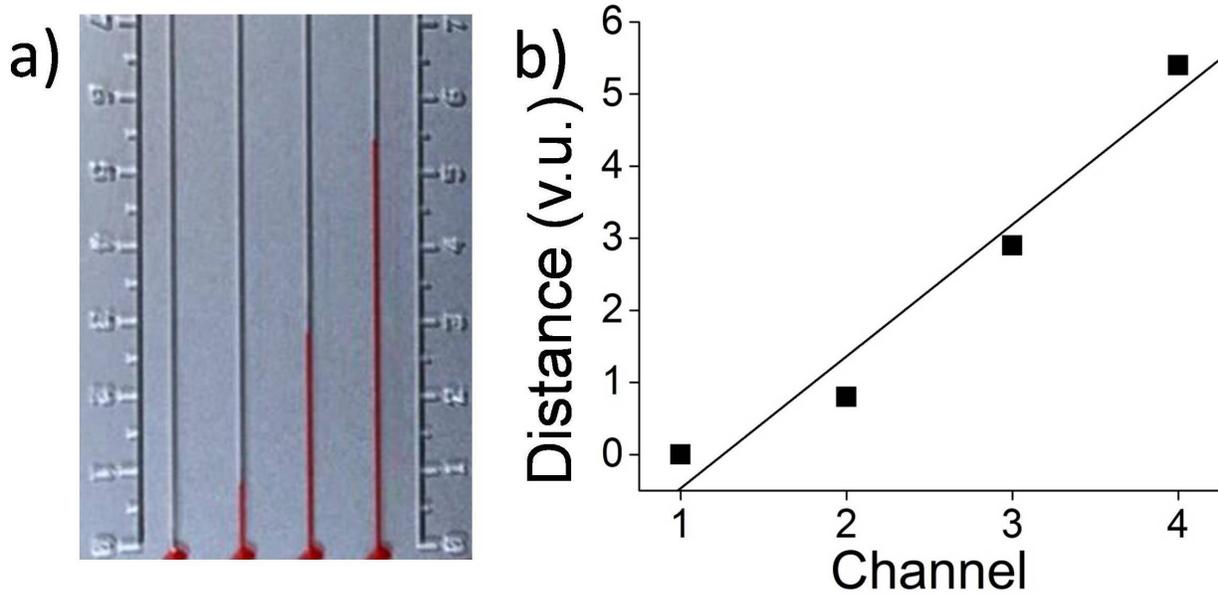


Fig. S11. Image of bar-chart readout a) and quantitation b) of reaction of 35% H_2O_2 with PtNPs at different concentrations (diffusion gradient, 20 mg mL^{-1} PtNPs in the initial solution). v.u., IV-Chip unit.

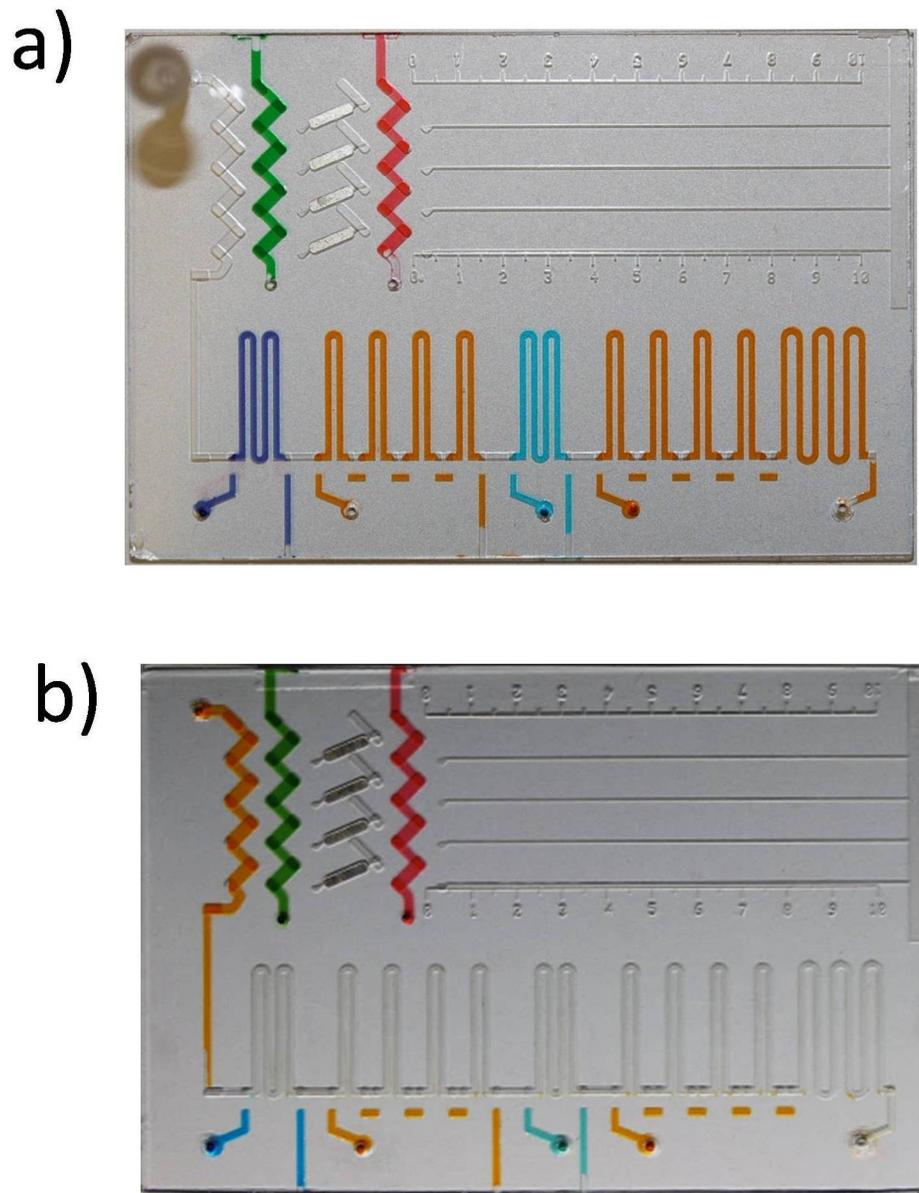


Fig. S12. Site of generation of negative pressure is indicated by pipette tip (a) and pressure-mediated movement of plugs out of the channel (b). Dark blue, sample; yellow, washing buffer; light blue, PtNP probe; green, food dye; red, ink.

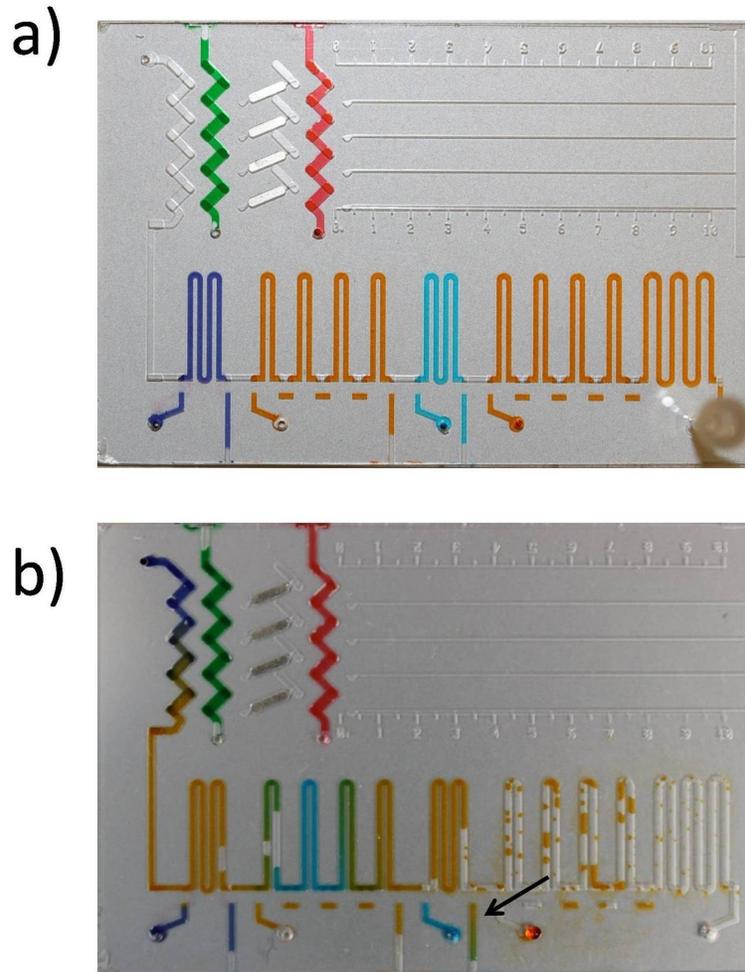
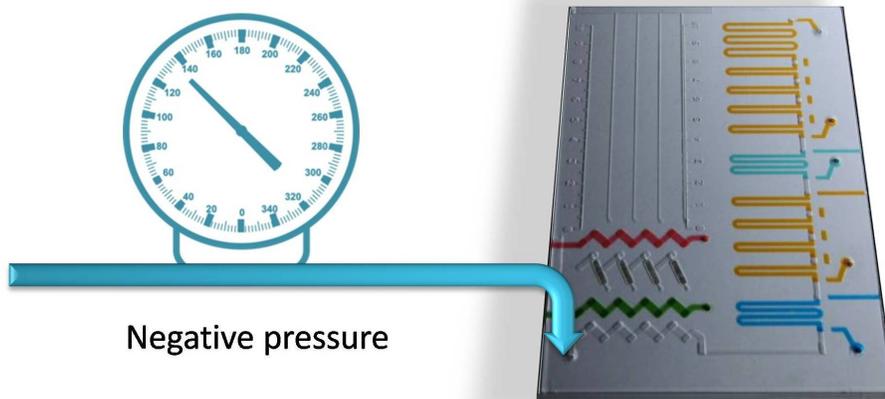


Fig. S13. Site of generation of positive pressure is indicated by pipette tip (a), and pressure-mediated movement of plugs out of the channel (b). Arrow indicates contamination between the plug channels. Dark blue, sample; yellow, washing buffer; light blue, PtNP probe; green, food dye; red, ink.



Pressure	Time	Result (v.u.)
-0.51 KPa	26	1
-0.34 KPa	56	1.5
-0.17 KPa	81	1.8
Pipette	90	1.9

Fig. S14. A range of negative pressures was used to measure 1 ngmL^{-1} TnI. Time, time required for fluid plugs to flow completely flow through the channel; result, distance (v.u.) traveled by red ink.v.u., IV-Chip unit.

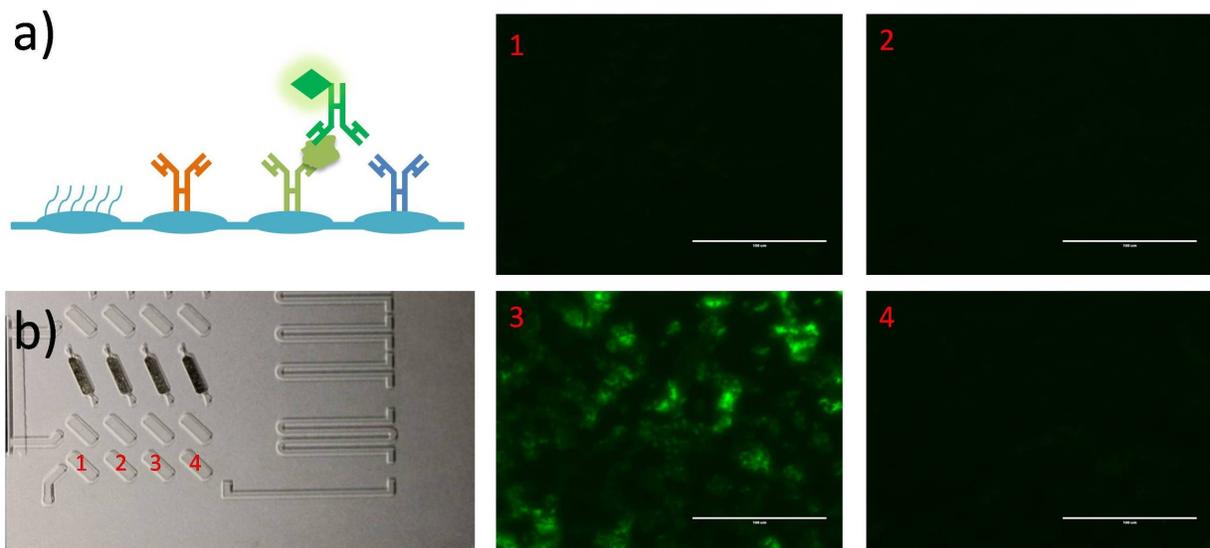
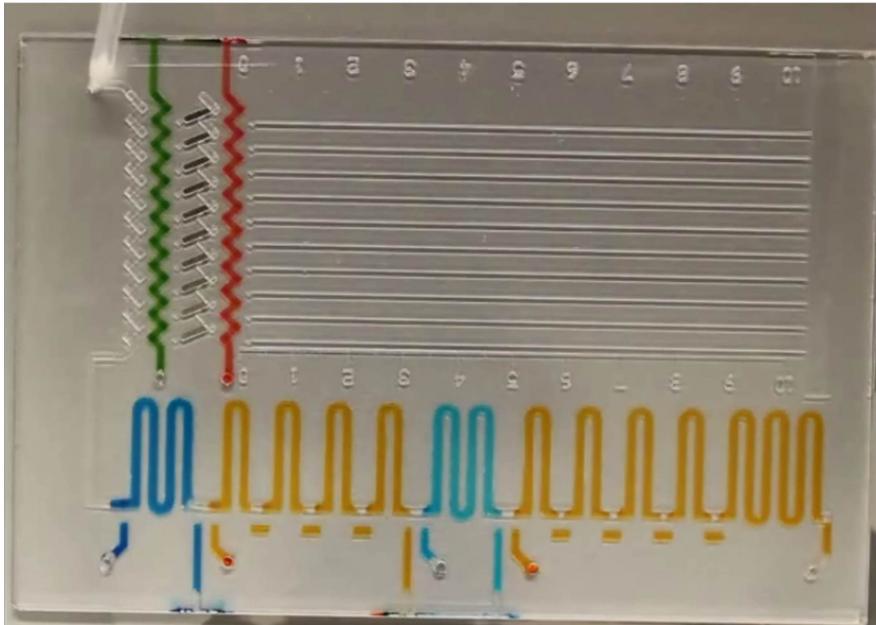


Fig. S15.(a) Schematic diagram illustrates results of specificity test using FITC-conjugated anti-TnI antibody. From left, well 1 contains control (BSA) (light blue lines); well 2, anti-CK-MB (orange); well 3, TnI bound to unlabeled anti-TnI (both olive green) and in turn to FITC-conjugated anti-TnI (bright green); well 4, anti-myoglobin (dark blue).(b) Numbers show the position of the wells corresponding to the wells in a) and the fluorescence images in the numbered panels. Fluorescence images were obtained from the center of each well. Scale bar, 100 μm .

Table S1. De-identified information for patients tested for MI detection with the IV-Chip. Unit for CK-MB, Tn I and Myoglobin is ngml⁻¹. Subjects 1–24 (bordered in red) represent MI patients and subjects 25–36 (bordered in green) represent healthy controls. C, Caucasian; Z, other; B, black/African American.

Subjects	Gender	Age (years)	Race	CK-MB	Tn I	Myoglobin
1	M	71	C	1.464	2.297	12.938
2	M	54	C	1.487	1.76	44.813
3	M	61	C	12.002	0.3585	57.728
4	F	80	C	2.247	1.389	59.652
6	M	61	C	2.387	2.227	74.49
6	M	74	C	2.157	3.2575	35.471
7	M	39	Z	2.144	0.3585	1199.199
8	F	89	C	4.503	5.3045	39.043
9	M	62	C	2.438	2.5015	24.204
10	M	47	Z	2.228	16.1175	31.624
11	F	63	Z	2.586	4.3705	205.01
12	F	92	Z	2.28	0.3585	1240.142
13	F	83	B	2.2134	1.1965	598.511
14	M	64	C	14.112	0.647	26.128
15	F	56	C	16.986	1.114	176.986
16	M	56	C	1.572	0.647	123.15
17	F	94	B	14.494	0.9215	33.547
18	F	93	B	13.695	6.1425	20.357
19	F	68	B	14.551	0.276	262.995
20	F	43	Z	13.289	0.5505	18.708
21	M	69	C	14.01	0.647	195.672
22	F	73	B	14.335	0.5055	147.309
23	F	51	C	9.785	0.0125	154.729
24	F	55	C	1.477	0.9215	20.357
25	F	46	C	1.464	0.4545	46.462
26	F	85	C	1.471	0.3585	40.966
27	M	68	C	2.096	0.18	27.777
28	M	62	C	2.207	0.18	20.357
29	M	83	C	2.344	0.276	22.281
30	M	87	C	2.305	0.4545	24.204
31	M	56	Z	2.247	0.276	24.204
32	F	80	C	1.469	0.0125	31.624
33	F	85	C	1.4	0.523	31.624
34	F	70	Z	1.427	0.562	29.7
35	M	75	C	1.391	0.344	35.471
36	M	56	Z	1.453	0.4545	41.575



Movie S1. Movie shows the fluid plugs flowing out of the channel under negative pressure of 1500 KPa.