

## Supplementary Materials

This supplementary information includes details of feature fabrication, additional experimental variations and associated concentration profiles across the three exit ports for the devices under consideration.

For the first generation devices, the fabrication process began by creating masks for pattern transfer. Two families of masks were produced: fields of geometric features and blank fields (channels). Fabrication procedures were the same for both. Masks were drawn in Inventor (Autodesk, San Rafael, CA, USA) and printed on transparencies (resolution better than 5080 dpi) using a commercial vendor (PageWorks Cambridge, MA, USA). These transparency masks were taped to a blank 12.7 cm × 12.7 cm glass plate and secured directly into a commercial mask holder (ABM Mask Aligner, Scotts Valley, CA, USA) for pattern transfer. Generation 1 devices were fabricated on glass microscope slides. Borosilicate, soda lime, and quartz slides were evaluated, and etch rates, surface roughness, and uniformity were considered. Etch rates on quartz slides were extremely slow while the borosilicate slides produced features with significant roughness. The best results were obtained with soda lime glass substrates (Ted Pella Inc., Redding, CA, USA). Evaluations also showed that the desirable etch depth (~5 μm) could not be obtained using a photoresist mask. A metal mask was instead transferred to the glass substrates using a lift-off process [1].

Soda lime glass microscope slides (2.54 cm × 7.62 cm) were extensively cleaned for at least 3 h in piranha cleaning solution followed by copious rinsing with deionized water. Negative photoresist (product NR-7 P1000, Futurrex Inc., Franklin, NJ, USA) was spun onto the substrates using the manufacturers recommended protocol. The photoresist was patterned on a mask aligner with 365 nm light and developed in RD6 solution (Futurrex, Inc). A thin layer of gold (100 nm) with an adhesion layer of chromium (30 nm) was deposited on the slides using an electron-beam evaporator (Temescal, model FC-2000, Livermore, CA, USA). Chromium was chosen as an adhesion layer because it was found to be more resistant than titanium to the glass etchants. The glass slides were placed in an acetone bath to dissolve the photoresist and transfer the pattern onto the slides by lift-off process. Glass slides with metal feature masks were etched in buffered oxide etch (BOE) solution with constant stirring (BOE:HCl:H<sub>2</sub>O 1.5:1:6 by vol.). The conditions utilized resulted in etch rates of 1.25–1.5 μm/min. Slower etch rates and the presence of hydrochloric acid were found to reduce surface roughness following the etch process. Slides were thoroughly cleaned in DI water and sequentially placed in warm (40°C) Aqua Regia solution (HCl:HNO<sub>3</sub>, 3:1) and Chrome etch (CR-9, Cynatek Corp. Fremont, CA, USA) to remove the Au and Cr layers, respectively. Finally, slides were cleaned in piranha solution, rinsed, and dried.

For the second generation of devices, patterns were drawn in L-Edit software (Tanner EDA, Monrovia, CA, USA). These patterns were converted to GDSII format, used to expose glass photomask blanks on a Heidelberg DWL-66 Laser Pattern Generator (Heidelberg Instruments, Heidelberg, Germany), developed with AZ developers, and etched with CR-9 chrome etchant using standard procedures. Second generation devices were fabricated on four inch silicon wafers. Similar to the glass slides, they were first cleaned, dried, and patterned with NR-7 photoresist. In this case, however, material was removed from the silicon wafers using the Bosch process in a plasma assisted deep reactive ion etching station (Oxford Instruments, Tubney Wood, Abingdon, UK). The chosen

conditions allowed etch rates of roughly 1–1.25  $\mu\text{m}/\text{step}$ . After etching, the wafers were stripped of excess photoresist and cleaned in an oxygen plasma.

During process development, devices were characterized by both light and electron microscopy to verify the integrity of the geometric feature shapes after etching. Fabrication conditions were adjusted until the desired geometry was realized in the substrates. For the first generation glass devices, the mask features were made larger (1:1.5) to compensate for lateral etch due to the isotropic nature of the wet etch process, and features with curved side walls resulted. The Bosch DRIE process is inherently anisotropic and produced features with near vertical sidewalls. The etch depths for each slide/wafer were measured with a surface profilometer (KLA-Tencor, model Alpha-Step 500, Milpitas, CA, USA). Etch depths for glass devices were found to range between 4  $\mu\text{m}$  and 6  $\mu\text{m}$  and, in some cases, exhibited considerable variability across the field. The DRIE process produced depths of 5–10  $\mu\text{m}$  with high uniformity across a single wafer as well as high reproducibility across multiple wafers. While the generation 1 glass devices provided desirable transparency, the uniformity of the features was of concern.

**Table S1.** Results for experiments conducted with generation 1 glass devices utilizing improper inlet port location. Nanoparticle concentration in the initial solution is  $1.11 \times 10^{16}$  p/L for these experiments. Ratios are calculated as the concentration at the exit port relative to the initial nanoparticle concentration. APS: 3-aminopropyltriethoxysilane.

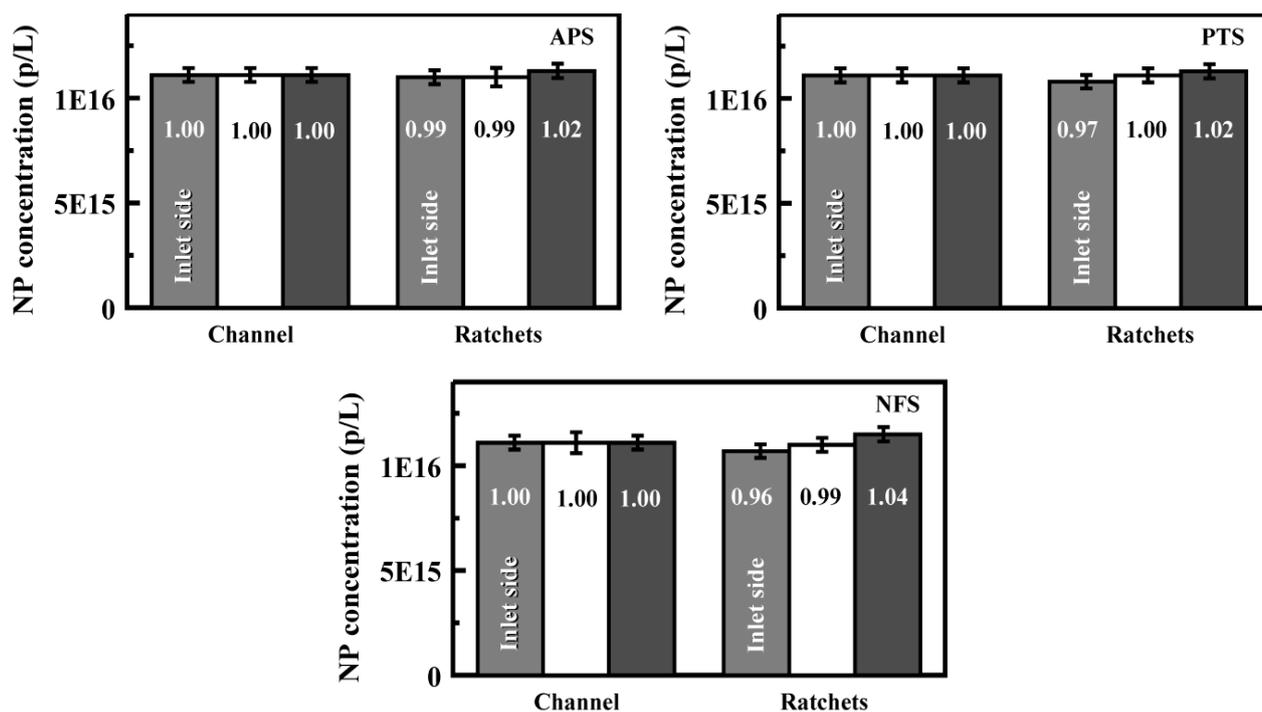
Channel/ Features	Functional group	[Group] (mM)	*	Inlet side port	Center port	Far side port
Channel	-	-	[NP] (Pp/L)	11.1	11.1	11.1
			Ratio	1.00	1.00	1.00
Features	-	-	[NP] (Pp/L)	11.1	11.2	11.1
			Ratio	1.00	1.01	1.00
Channel	APS	50	[NP] (Pp/L)	11.1	11.1	11.1
			Ratio	1.00	1.00	1.00
Features	APS	50	[NP] (Pp/L)	11.1	11.0	11.1
			Ratio	1.00	0.99	1.00
Features	APS	150	[NP] (Pp/L)	11.1	11.1	11.0
			Ratio	1.00	1.00	0.99

\* [NP] = nanoparticle concentrations in Peta ( $10^{15}$ ) particles per liter.

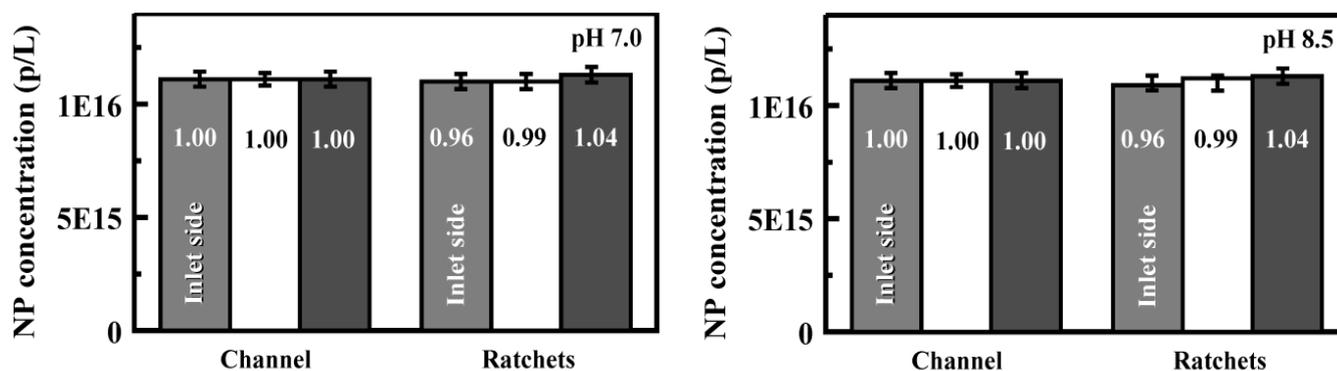
**Table S2.** Results for experiments conducted with generation 1 glass devices. Nanoparticle concentration in the initial solution is  $1.11 \times 10^{16}$  p/L for these experiments. Ratios are calculated as the concentration at the exit port relative to the initial nanoparticle concentration. PTS: phenyltrimethoxysilane; NFS: nonafluorohexyltriethoxysilane.

Channel/ Features	Functional group	[Group] (mM)	Solution pH	*	Inlet side port	Center port	Far side port
Channel	-	-	-	[NP] (Pp/L) Ratio	11.1 1.00	11.1 1.00	11.1 1.00
Features	-	-	-	[NP] (Pp/L) Ratio	11.0 0.99	11.1 1.00	11.2 1.01
Channel	APS	50	--	[NP] (Pp/L) Ratio	11.1 1.00	11.1 1.00	11.1 1.00
Features	APS	50	--	[NP] (Pp/L) Ratio	10.7 0.96	11.0 0.99	11.5 1.04
Features	APS	150	--	[NP] (Pp/L) Ratio	11.0 0.99	11.0 0.99	11.3 1.02
Channel	APS	50	7.0	[NP] (Pp/L) Ratio	11.1 1.00	11.1 1.00	11.1 1.00
Features	APS	50	7.0	[NP] (Pp/L) Ratio	10.7 0.96	11.0 0.99	11.5 1.04
Features	APS	150	7.0	[NP] (Pp/L) Ratio	11.0 0.99	11.0 0.99	11.3 1.02
Channel	APS	50	8.5	[NP] (Pp/L) Ratio	11.1 1.00	11.1 1.00	11.1 1.00
Features	APS	50	8.5	[NP] (Pp/L) Ratio	11.0 0.96	11.0 0.98	11.3 1.05
Features	APS	150	8.5	[NP] (Pp/L) Ratio	10.9 0.97	11.2 1.00	11.3 1.02
Channel	PTS	50	-	[NP] (Pp/L) Ratio	11.1 1.00	11.1 1.00	11.1 1.00
Features	PTS	50	-	[NP] (Pp/L) Ratio	10.7 0.96	10.9 0.98	11.7 1.05
Features	PTS	150	-	[NP] (Pp/L) Ratio	10.8 0.97	11.1 1.00	11.3 1.02
Channel	NFS	50	-	[NP] (Pp/L) Ratio	11.1 1.00	11.1 1.00	11.1 1.00
Features	NFS	50	-	[NP] (Pp/L) Ratio	11.0 0.99	10.9 0.98	11.4 1.03
Features	NFS	150	-	[NP] (Pp/L) Ratio	10.7 0.96	11.0 0.99	11.5 1.04

\* [NP] = nanoparticle concentrations in Peta ( $10^{15}$ ) particles per liter.



**Figure S1.** Generation 1 performance-functionalization. Nanoparticle concentrations obtained for each exit port of the functionalized generation 1 devices. Results for both the channel only (50 mM) and the feature bearing devices (150 mM) are shown. Bars are, from left to right, exit port on the inlet side, at the center, and furthest from the inlet side. Nanoparticle solutions utilized for these experiments were  $1.11 \times 10^{16}$  p/L. Data presented is the average of three replicates.

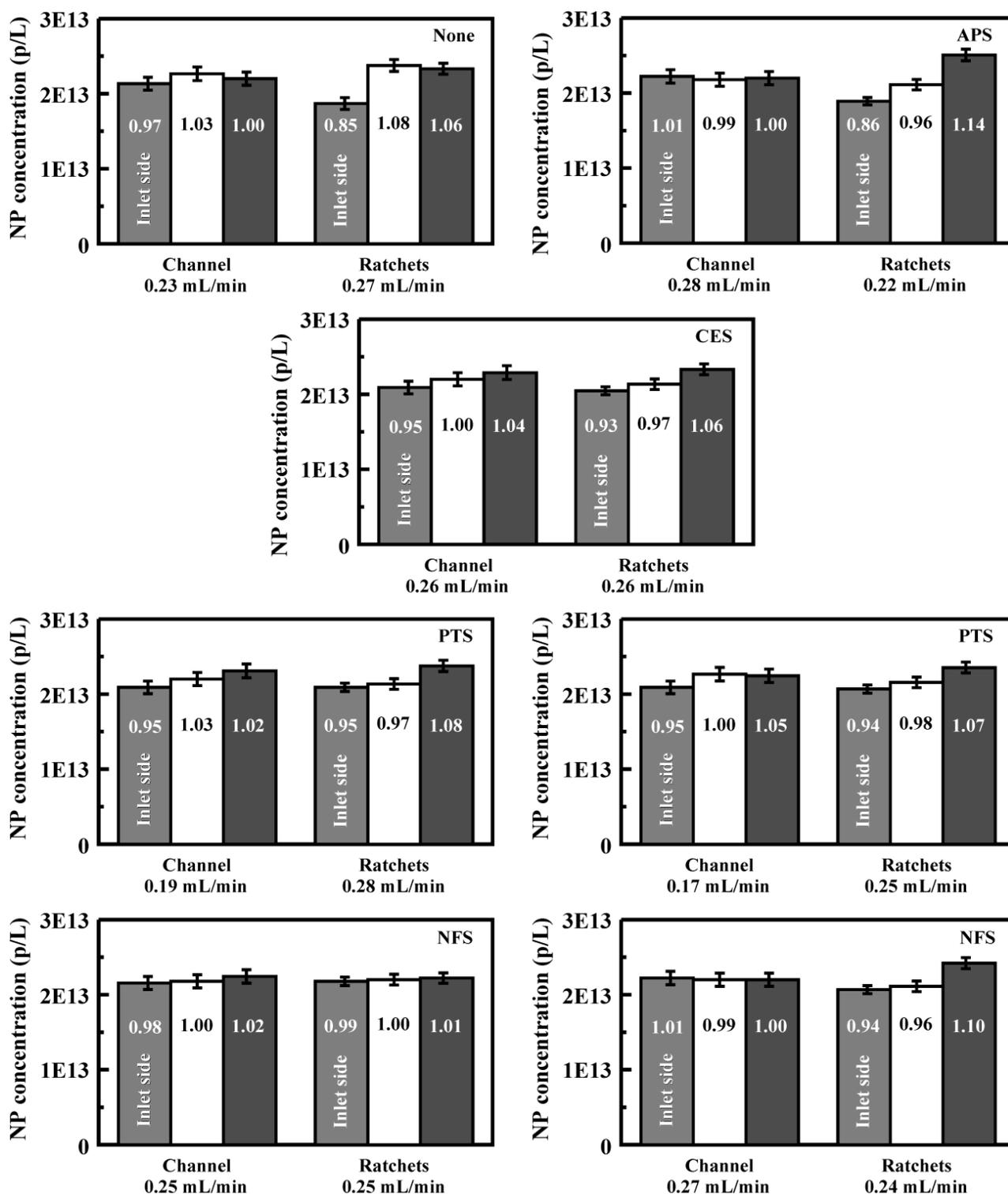


**Figure S2.** Generation 1 performance-pH. Nanoparticle concentrations obtained for each exit port of the APS functionalized generation 1 devices for solutions of varied pH. Results for both the channel only (50 mM) and the feature bearing devices (150 mM) are shown. Bars are, from left to right, exit port on the inlet side, at the center, and furthest from the inlet side. Nanoparticle solutions utilized for these experiments were  $1.11 \times 10^{16}$  p/L. Data presented is the average of three replicates.

**Table S3.** Results for experiments conducted with generation 2 glass devices. Nanoparticle concentration in the initial solution is  $2.2 \times 10^{13}$  p/L for these experiments. Ratios are calculated as the concentration at the exit port relative to the initial nanoparticle concentration. CES: carboxyethylsilanetriol.

Channel/Features	Functional group	Flow rate (mL/min)	*	Inlet side port	Center port	Far side port
Channel	None	0.25	[NP] (Tp/L)	22.7	22.0	21.3
			Ratio	1.03	1.00	0.97
Channel	None	0.23	[NP] (Tp/L)	21.3	22.7	22.0
			Ratio	0.97	1.03	1.00
Features	None	0.27	[NP] (Tp/L)	18.7	23.8	23.3
			Ratio	0.85	1.08	1.06
Features	None	0.25	[NP] (Tp/L)	19.6	23.8	23.3
			Ratio	0.89	1.00	1.12
Channel	APS	0.26	[NP] (Tp/L)	22.7	21.3	21.6
			Ratio	1.03	0.97	0.98
Channel	APS	0.28	[NP] (Tp/L)	22.2	21.8	22.0
			Ratio	1.01	0.99	1.00
Features	APS	0.22	[NP] (Tp/L)	18.9	21.1	25.1
			Ratio	0.86	0.96	1.14
Features	APS	0.25	[NP] (Tp/L)	20.9	21.1	23.8
			Ratio	0.95	0.95	1.08
Channel	CES	0.26	[NP] (Tp/L)	20.7	22.0	23.1
			Ratio	0.95	1.00	1.04
Channel	CES	0.25	[NP] (Tp/L)	20.5	21.3	23.3
			Ratio	0.95	1.02	1.03
Features	CES	0.25	[NP] (Tp/L)	20.9	22.0	22.9
			Ratio	0.94	1.00	1.05
Features	CES	0.26	[NP] (Tp/L)	20.9	22.4	22.7
			Ratio	0.93	0.97	1.06
Channel	PTS	0.17	[NP] (Tp/L)	20.9	22.0	23.1
			Ratio	0.95	1.00	1.05
Channel	PTS	0.19	[NP] (Tp/L)	20.9	22.7	22.4
			Ratio	0.95	1.03	1.02
Features	PTS	0.25	[NP] (Tp/L)	20.7	21.6	23.5
			Ratio	0.94	0.98	1.07
Features	PTS	0.28	[NP] (Tp/L)	20.9	21.3	23.8
			Ratio	0.95	0.97	1.08
Channel	NFS	0.27	[NP] (Tp/L)	22.2	22.0	22.0
			Ratio	1.01	0.99	1.00
Channel	NFS	0.25	[NP] (Tp/L)	21.6	21.8	22.4
			Ratio	0.98	1.00	1.02
Features	NFS	0.25	[NP] (Tp/L)	21.8	22.0	22.2
			Ratio	0.99	1.00	1.01
Features	NFS	0.24	[NP] (Tp/L)	20.7	21.1	24.2
			Ratio	0.94	0.96	1.10

\* [NP] = nanoparticle concentrations in Tera ( $10^{12}$ ) particles per liter.



**Figure S3.** Generation 2 performance - Functionalization. Nanoparticle concentrations obtained for each exit port of the generation 2 devices for solutions in water. Functionalized devices were prepared using 20 mM precursor solutions. Results for both the channel only and the feature bearing devices are shown. Bars are, from left to right, exit port on the inlet side, at the center, and furthest from the inlet side. Nanoparticle solutions utilized for these experiments were  $2.2 \times 10^{13}$  p/L. Data presented is the average of at least three replicates.

**Table S4.** Results for experiments conducted with generation 2 glass devices in which the inlet port was on the improper side of the device. Nanoparticle concentration in the initial solution is  $2.2 \times 10^{13}$  p/L for these experiments. Ratios are calculated as the concentration at the exit port relative to the initial nanoparticle concentration.

Channel/Features	Functional group	Flow rate (mL/min)	*	Inlet side port	Center port	Far side port
Features	None	0.24	[NP] (Tp/L)	21.8	22.4	21.6
			Ratio	1.00	1.02	0.98
Features	None	0.29	[NP] (Tp/L)	22.2	22.0	22.0
			Ratio	1.01	1.00	0.99

\* [NP] = nanoparticle concentrations in Tera ( $10^{12}$ ) particles per liter.

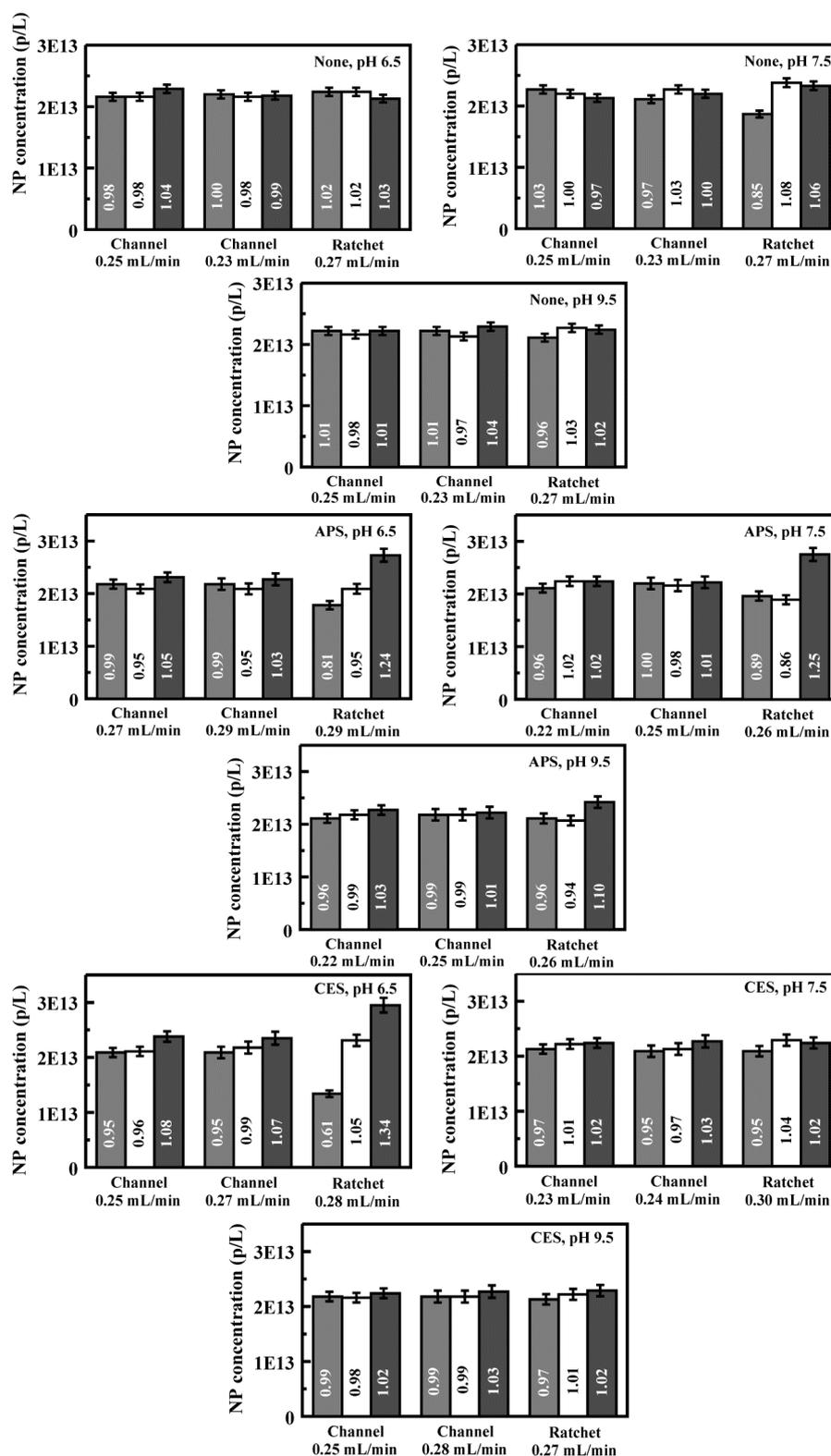
**Table S5.** Results for experiments conducted with generation 2 glass devices. Nanoparticle concentration in the initial solution is  $2.2 \times 10^{13}$  p/L for these experiments. Ratios are calculated as the concentration at the exit port relative to the initial nanoparticle concentration.

Channel/Features	Functional group	Flow rate (mL/min)	Solution pH	*	Inlet side port	Center port	Far side port
Channel	None	0.25	6.5	[NP] (Tp/L)	21.6	21.6	22.9
				Ratio	0.98	0.98	1.04
Channel	None	0.23	6.5	[NP] (Tp/L)	22.0	21.6	21.8
				Ratio	1.00	0.98	0.99
Features	None	0.27	6.5	[NP] (Tp/L)	22.4	22.4	21.3
				Ratio	1.02	1.02	0.97
Features	None	0.25	6.5	[NP] (Tp/L)	22.7	21.1	22.0
				Ratio	1.03	0.96	1.00
Channel	None	0.25	7.5	[NP] (Tp/L)	22.7	22.0	21.3
				Ratio	1.03	1.00	0.97
Channel	None	0.23	7.5	[NP] (Tp/L)	21.1	22.7	22.0
				Ratio	0.97	1.03	1.00
Features	None	0.27	7.5	[NP] (Tp/L)	18.7	23.8	23.3
				Ratio	0.85	1.08	1.06
Features	None	0.25	7.5	[NP] (Tp/L)	19.6	22.0	24.6
				Ratio	0.89	1.00	1.12
Channel	None	0.25	9.5	[NP] (Tp/L)	22.2	21.6	22.2
				Ratio	1.01	0.98	1.01
Channel	None	0.23	9.5	[NP] (Tp/L)	22.2	21.3	22.9
				Ratio	1.01	0.97	1.04
Features	None	0.27	9.5	[NP] (Tp/L)	21.1	22.7	22.4
				Ratio	0.96	1.03	1.02
Features	None	0.25	9.5	[NP] (Tp/L)	20.7	22.9	22.4
				Ratio	0.94	1.04	1.02
Channel	APS	0.27	6.5	[NP] (Tp/L)	21.8	20.9	23.1
				Ratio	0.99	0.95	1.05
Channel	APS	0.29	6.5	[NP] (Tp/L)	21.8	20.9	22.7
				Ratio	0.99	0.95	1.03

Table S5. Cont.

Channel/ Features	Functional group	Flow rate (mL/min)	Solution pH	*	Inlet side port	Center port	Far side port
Features	APS	0.27	6.5	[NP] (Tp/L)	15.8	21.6	28.6
				Ratio	0.72	0.98	1.30
Features	APS	0.29	6.5	[NP] (Tp/L)	17.8	20.9	27.3
				Ratio	0.81	0.95	1.24
Channel	APS	0.22	7.5	[NP] (Tp/L)	21.1	22.4	22.4
				Ratio	0.96	1.02	1.02
Channel	APS	0.25	7.5	[NP] (Tp/L)	22.0	21.6	22.2
				Ratio	1.00	0.98	1.01
Features	APS	0.25	7.5	[NP] (Tp/L)	12.1	24.0	29.9
				Ratio	0.55	1.09	1.36
Features	APS	0.26	7.5	[NP] (Tp/L)	19.6	18.9	27.5
				Ratio	0.89	0.86	1.25
Channel	APS	0.22	9.5	[NP] (Tp/L)	21.1	21.8	22.7
				Ratio	0.96	0.99	1.03
Channel	APS	0.25	9.5	[NP] (Tp/L)	21.8	21.8	22.2
				Ratio	0.99	0.99	1.01
Features	APS	0.25	9.5	[NP] (Tp/L)	20.2	22.2	23.5
				Ratio	0.92	1.01	1.07
Features	APS	0.26	9.5	[NP] (Tp/L)	21.1	20.7	24.2
				Ratio	0.96	0.94	1.10
Channel	CES	0.25	6.5	[NP] (Tp/L)	20.9	21.1	23.8
				Ratio	0.95	0.96	1.08
Channel	CES	0.27	6.5	[NP] (Tp/L)	20.9	21.8	23.5
				Ratio	0.95	0.99	1.07
Features	CES	0.28	6.5	[NP] (Tp/L)	13.4	23.1	29.5
				Ratio	0.61	1.05	1.34
Features	CES	0.26	6.5	[NP] (Tp/L)	12.3	20.2	33.4
				Ratio	0.56	0.92	1.52
Channel	CES	0.23	7.5	[NP] (Tp/L)	21.3	22.2	22.4
				Ratio	0.97	1.01	1.02
Channel	CES	0.24	7.5	[NP] (Tp/L)	20.9	21.3	22.7
				Ratio	0.95	0.97	1.03
Features	CES	0.27	7.5	[NP] (Tp/L)	13.2	25.5	27.5
				Ratio	0.60	1.16	1.25
Features	CES	0.30	7.5	[NP] (Tp/L)	20.9	22.9	22.4
				Ratio	0.95	1.04	1.02
Channel	CES	0.25	9.5	[NP] (Tp/L)	21.8	21.6	22.4
				Ratio	0.99	0.98	1.02
Channel	CES	0.28	9.5	[NP] (Tp/L)	21.8	21.8	22.7
				Ratio	0.99	0.99	1.02
Features	CES	0.27	9.5	[NP] (Tp/L)	21.3	22.2	22.9
				Ratio	0.97	1.01	1.02
Features	CES	0.25	9.5	[NP] (Tp/L)	21.3	21.8	22.4
				Ratio	0.97	0.99	1.04

\* [NP] = nanoparticle concentrations in Tera ( $10^{12}$ ) particles per liter.



**Figure S4.** Generation 2 performance-pH. Nanoparticle concentrations obtained for each exit port of the generation 2 devices for solutions at varied pH. Functionalized devices were prepared using 20 mM precursor solutions. Results for both the channel only and the feature bearing devices are shown. Bars are, from left to right, exit port on the inlet side, at the center, and furthest from the inlet side. Nanoparticle solutions utilized for these experiments were  $2.2 \times 10^{13}$  p/L. Data presented is the average of at least three replicates.

**Table S6.** Results for experiments conducted with generation 2 glass devices. Nanoparticle concentration in the initial solution is  $2.2 \times 10^{14}$  p/L for these experiments. Ratios are calculated as the concentration at the exit port relative to the initial nanoparticle concentration.

Channel/Features	Functional Group	Flow rate (mL/min)	*	Inlet side port	Center port	Far side port
Channel	None	0.23	[NP] (Tp/L)	222	222	211
			Ratio	1.01	1.01	0.96
Channel	None	0.26	[NP] (Tp/L)	220	224	211
			Ratio	1.00	1.02	0.96
Features	None	0.28	[NP] (Tp/L)	216	227	218
			Ratio	0.98	1.03	0.99
Features	None	0.29	[NP] (Tp/L)	218	218	222
			Ratio	0.99	0.99	1.01
Channel	APS	0.26	[NP] (Tp/L)	227	213	218
			Ratio	1.03	0.97	0.99
Channel	APS	0.29	[NP] (Tp/L)	218	213	227
			Ratio	0.99	0.97	1.03
Features	APS	0.26	[NP] (Tp/L)	220	213	227
			Ratio	1.00	0.97	1.03
Features	APS	0.28	[NP] (Tp/L)	216	224	218
			Ratio	0.98	1.02	0.99
Channel	CES	0.27	[NP] (Tp/L)	218	218	227
			Ratio	0.99	0.99	1.03
Channel	CES	0.28	[NP] (Tp/L)	218	218	231
			Ratio	0.99	0.99	1.03
Features	CES	0.28	[NP] (Tp/L)	205	218	227
			Ratio	0.93	0.99	1.03
Features	CES	0.30	[NP] (Tp/L)	218	216	222
			Ratio	0.99	0.98	1.01
Channel	PTS	0.19	[NP] (Tp/L)	222	220	220
			Ratio	1.00	1.00	1.00
Channel	PTS	0.20	[NP] (Tp/L)	217	218	227
			Ratio	0.98	0.99	1.03
Features	PTS	0.28	[NP] (Tp/L)	218	218	222
			Ratio	0.99	0.99	1.01
Features	PTS	0.26	[NP] (Tp/L)	207	220	220
			Ratio	0.94	1.00	1.02
Channel	NFS	0.26	[NP] (Tp/L)	217	222	220
			Ratio	0.98	1.01	1.00
Channel	NFS	0.28	[NP] (Tp/L)	218	213	227
			Ratio	0.99	0.97	1.03
Features	NFS	0.21	[NP] (Tp/L)	198	213	257
			Ratio	0.90	0.97	1.17
Features	NFS	0.25	[NP] (Tp/L)	216	220	224
			Ratio	0.98	1.00	1.02

\* [NP] = nanoparticle concentrations in Tera ( $10^{12}$ ) particles per liter.

**Table S7.** Results for experiments conducted with generation 2 glass devices. Nanoparticle concentration in the initial solution is  $2.2 \times 10^{14}$  p/L for these experiments.

Channel/ Features	Functional group	Flow rate (mL/min)	Solution pH	*	Inlet side port	Center port	Far side port
Channel	APS	0.24	6.5	[NP] (Tp/L)	211	224	224
				Ratio	0.96	1.02	1.02
Channel	APS	0.25	6.5	[NP] (Tp/L)	213	227	220
				Ratio	0.97	1.03	1.00
Features	APS	0.26	6.5	[NP] (Tp/L)	209	213	238
				Ratio	0.95	0.97	1.08
Features	APS	0.27	6.5	[NP] (Tp/L)	205	227	229
				Ratio	0.93	1.03	1.04
Channel	APS	0.22	7.5	[NP] (Tp/L)	220	229	213
				Ratio	1.00	1.04	0.97
Channel	APS	0.23	7.5	[NP] (Tp/L)	218	220	222
				Ratio	0.99	1.00	1.01
Features	APS	0.22	7.5	[NP] (Tp/L)	209	202	249
				Ratio	0.95	0.92	1.13
Features	APS	0.23	7.5	[NP] (Tp/L)	220	220	220
				Ratio	1.00	1.00	1.00
Channel	APS	0.24	9.5	[NP] (Tp/L)	216	222	222
				Ratio	0.98	1.01	1.01
Channel	APS	0.22	9.5	[NP] (Tp/L)	224	218	218
				Ratio	1.02	0.99	0.99
Features	APS	0.23	9.5	[NP] (Tp/L)	216	218	227
				Ratio	0.98	0.99	1.03
Features	APS	0.22	9.5	[NP] (Tp/L)	207	233	244
				Ratio	0.94	1.06	1.11
Channel	CES	0.25	6.5	[NP] (Tp/L)	227	220	213
				Ratio	1.03	1.00	0.97
Channel	CES	0.26	6.5	[NP] (Tp/L)	224	211	227
				Ratio	1.02	0.96	1.03
Features	CES	0.27	6.5	[NP] (Tp/L)	216	224	220
				Ratio	0.98	1.02	1.00
Features	CES	0.26	6.5	[NP] (Tp/L)	202	218	240
				Ratio	0.92	0.99	1.09
Channel	CES	0.22	7.5	[NP] (Tp/L)	224	213	222
				Ratio	1.02	0.97	1.01
Channel	CES	0.25	7.5	[NP] (Tp/L)	220	218	224
				Ratio	1.00	0.99	1.02
Features	CES	0.27	7.5	[NP] (Tp/L)	207	220	231
				Ratio	0.94	1.00	1.05

\* [NP] = nanoparticle concentrations in Tera ( $10^{12}$ ) particles per liter.

Table S7. *Cont.*

Channel/ Features	Functional group	Flow rate (mL/min)	Solution pH	*	Inlet side port	Center port	Far side port
Features	CES	0.25	7.5	[NP] (Tp/L)	211	220	229
				Ratio	0.96	1.00	1.04
Channel	CES	0.27	9.5	[NP] (Tp/L)	224	218	224
				Ratio	1.02	0.99	1.02
Channel	CES	0.25	9.5	[NP] (Tp/L)	222	213	224
				Ratio	1.01	0.97	1.02
Features	CES	0.25	9.5	[NP] (Tp/L)	209	233	242
				Ratio	0.95	1.06	1.10
Features	CES	0.26	9.5	[NP] (Tp/L)	218	218	222
				Ratio	0.99	0.99	1.01

\* [NP] = nanoparticle concentrations in Tera ( $10^{12}$ ) particles per liter.

## Reference

1. Li, P.C.H. *Microfluidic Lab-on-a-Chip for Chemical and Biological Analysis and Discovery*; CRC Press: Boca Raton, FL, USA, 2006.