

1 **Supplementary Information**

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4 **A Capillary Flow-Driven Microfluidic System for Microparticle-Labeled**
5 **Immunoassay**

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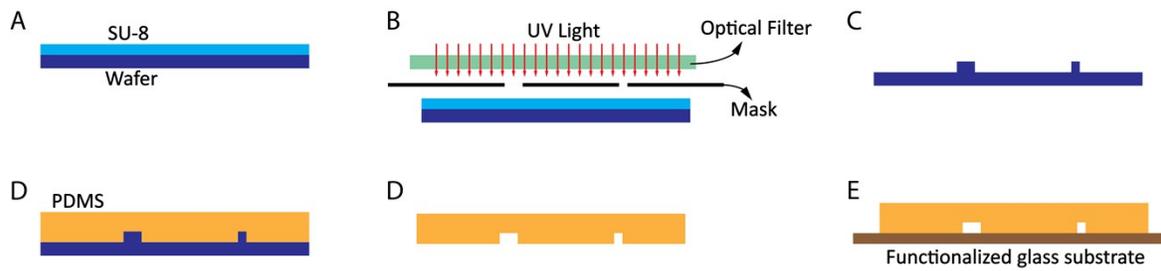
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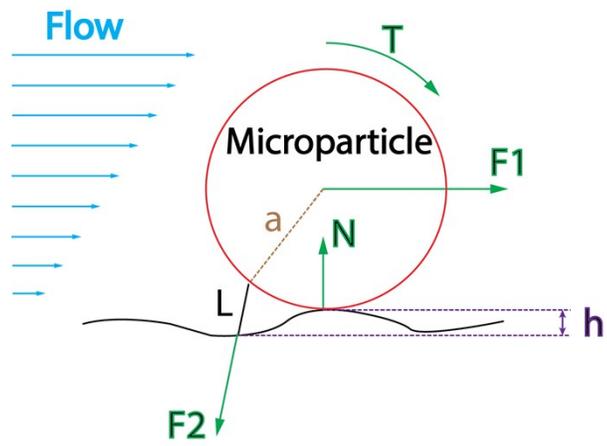
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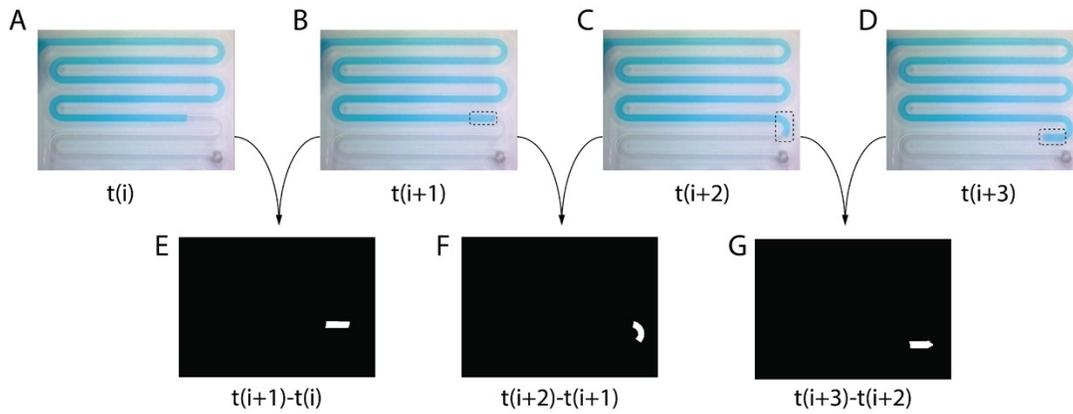
2 Figure S1. The photolithography of channel fabrication. (A) Photoresist (SU-8 2035) is spin coated
 3 onto the silicon wafer. (B) After the patterned mask is aligned, the surface is exposed to UV. To
 4 achieve a high side-wall quality, a PL-360LP photolithography mask aligner filter is used. (C) The
 5 photoresist is washed with an SU-8 developer. (D) A PDMS base material and a curing agent are
 6 mixed in a 5:1 ratio, poured onto the channel mold, and then cured. (E) The PDMS layer is peeled
 7 off. (F) The PDMS layer is bonded to the functionalized glass substrate.



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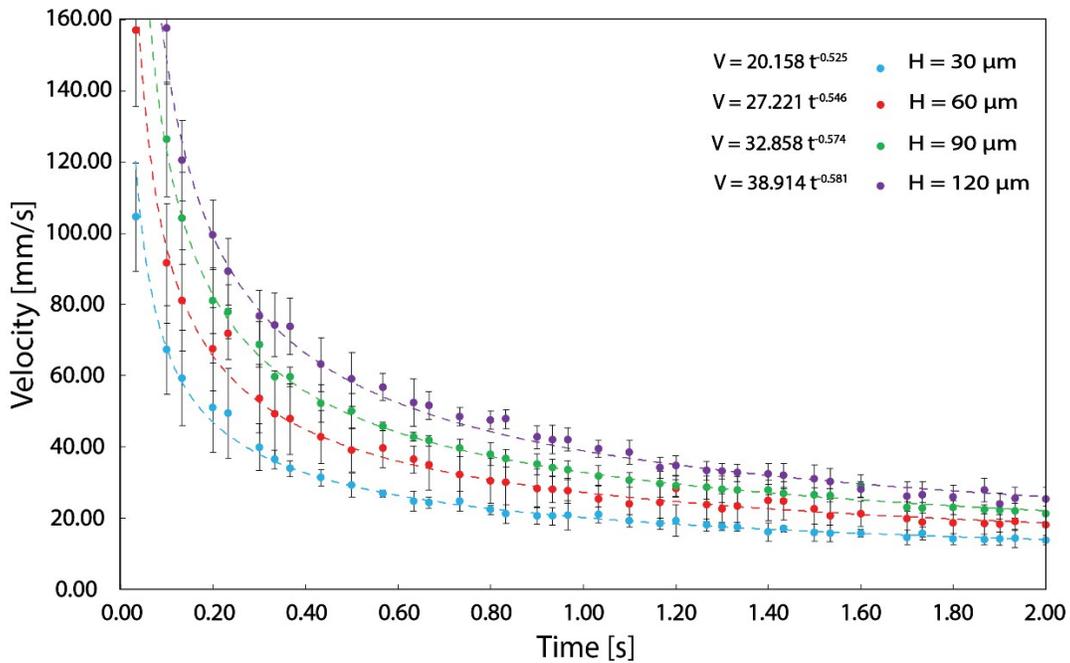
2 Figure S2. Forces on a single magnetic particle bonded to the capture antibody under laminar shear
3 flow.

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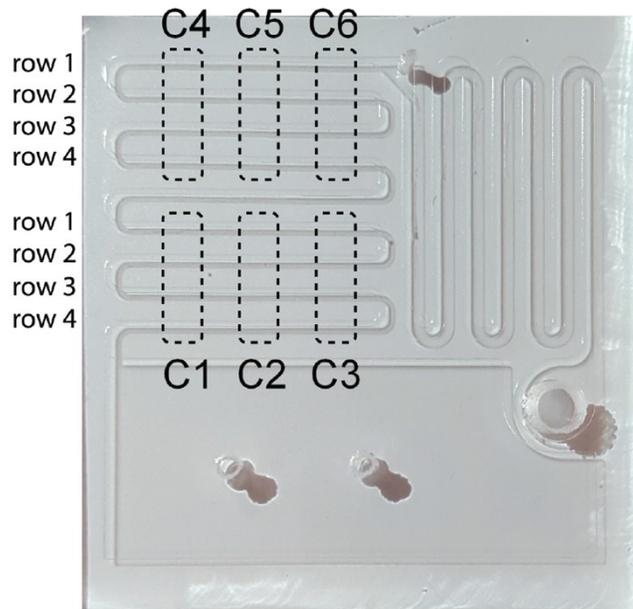
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2 Figure S3. Flow velocity measurements. Images extracted from the video of the flow movement
 3 were analyzed for flow characterization using MatLAB code. (A- D) The fluid movement at time
 4 steps $t(i)$, $t(i+1)$, $t(i+2)$ and $t(i+3)$, respectively. (E-G) The flow displacement for $t(i+1)-t(i)$, $t(i+2)-$
 5 $t(i+1)$, and $t(i+3)-t(i+2)$, respectively.



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2 Figure S4. Flow profiles for different channel heights. According to the Washburn equation, the
 3 velocity profiles in the buffer priming section are inversely proportional to the square root of
 4 passing time. Lines fitted to the experimental values show good agreement with the theoretical
 5 analysis. However, the power of “t” in the equations of the fitted curves are -0.525 to -0.581
 6 depending on aspect ratio from 6.67 to 1.67 instead of -0.5. This power value increases with the
 7 increase of aspect ratio from the high aspect ratio assumption^{28, 46}. Error bars represent standard
 8 deviation (SD) from three independent experiments.



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2 Figure S5. The actual device selectively bio-functionalized with different concentrations of the
3 capture antibody. $500\mu\text{g mL}^{-1}$, $50\mu\text{g mL}^{-1}$, $5\mu\text{g mL}^{-1}$, 500 ng mL^{-1} , 50 ng mL^{-1} and 5 ng mL^{-1}
4 are designated by C1, C2, C3, C4, C5 and C6, respectively.

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