

[Supplementary Material]

# High-speed lateral flow strategy for a fast biosensing with an improved selectivity and binding affinity

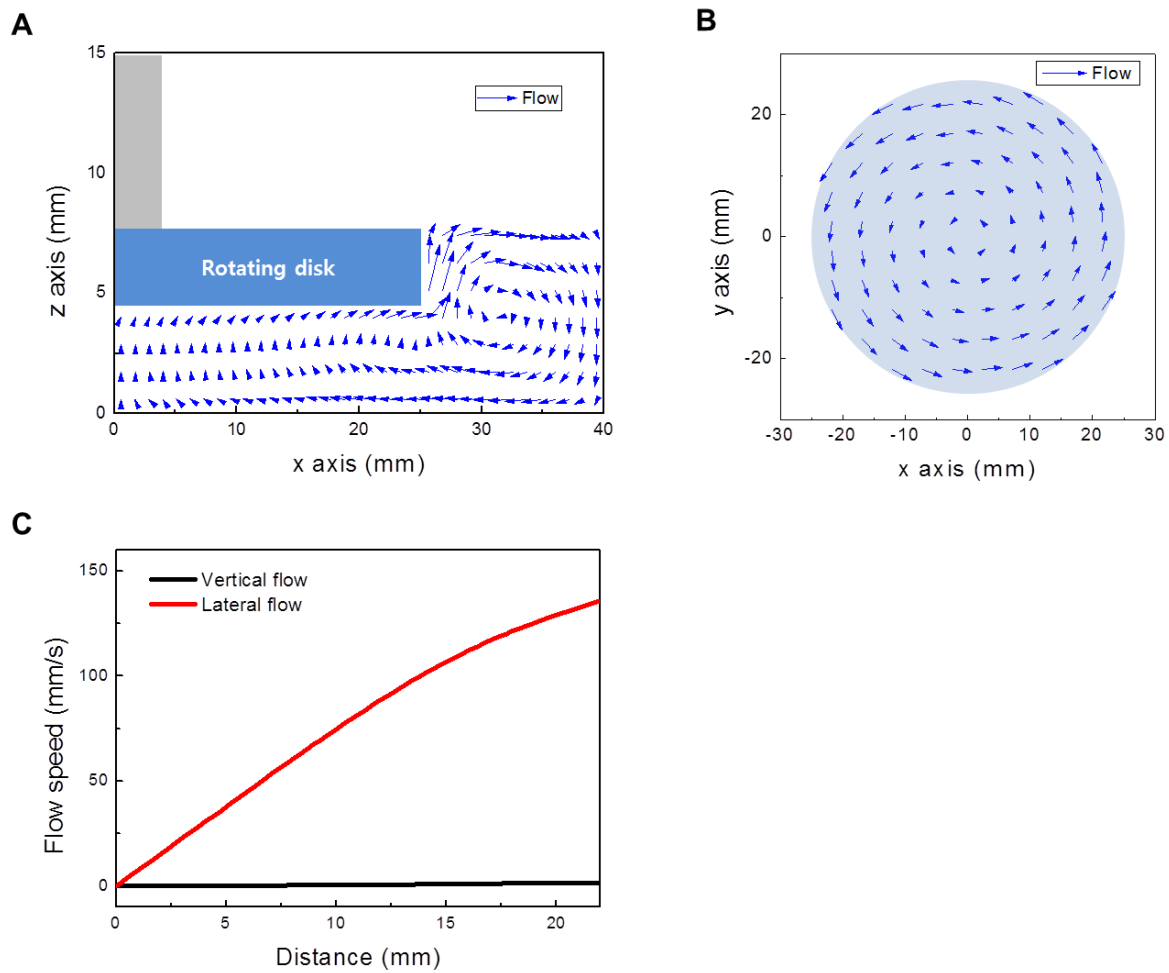
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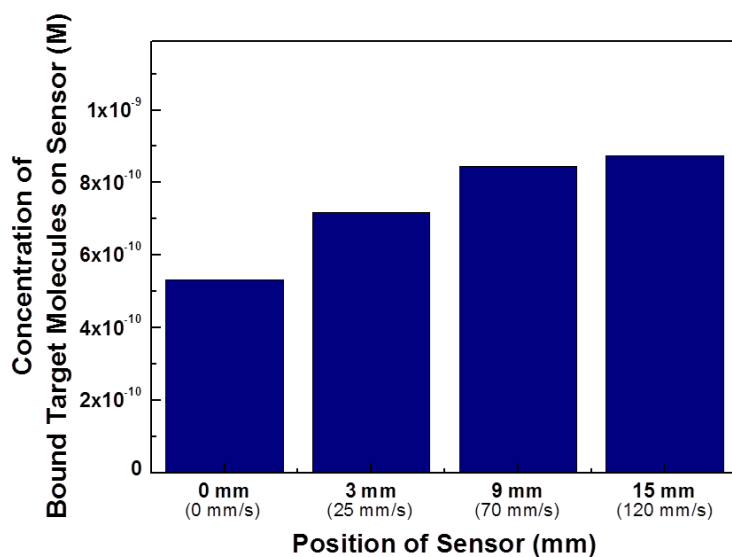
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**Figure S1**



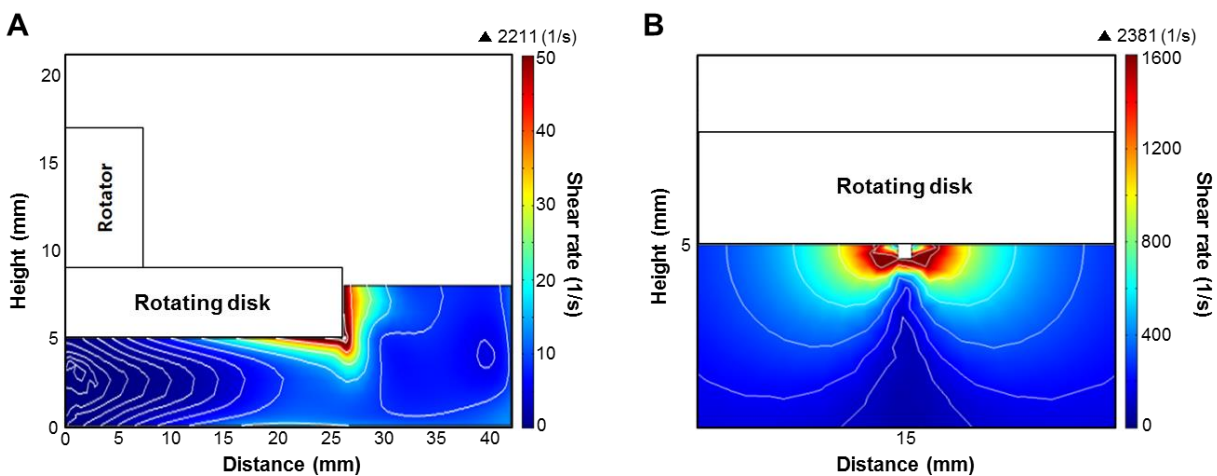
**Figure S1.** Simulation of fluidic flows generated by the rotation of a rotating disk with 150 rpm: (A) Cross section view of fluidic flows; (B) Lateral fluidic flows on the rotating disk; (C) Vertical and lateral flow speeds with distances from the center of the disk.

**Figure S2**



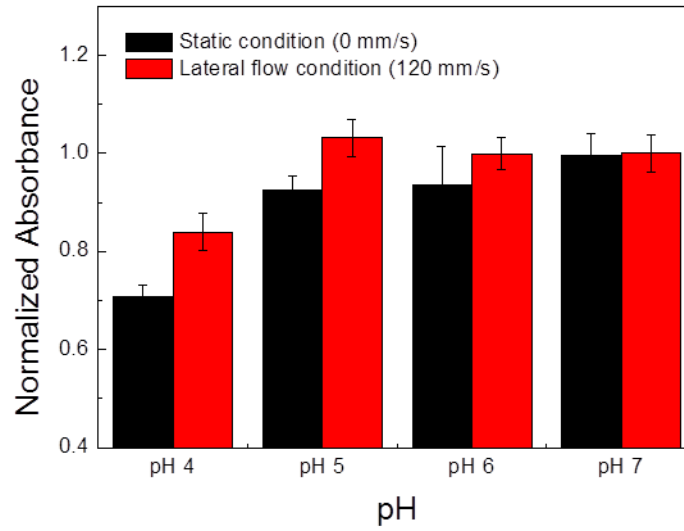
**Figure S2.** Simulation results of bound target molecules on sensing substrates located at 0, 3, 9 and 15 mm of a rotating disk. For the simulation, a commercial finite element method package (COMSOL Multiphysics) was used for the simulation of binding kinetics between a sensing substrate and target molecules. Target molecules were initially dispersed equally over a target solution. *The diffusion constant of target molecules and a binding constant  $K_D$  between the sensing substrate and target molecules was assumed as  $10^{-10} \text{ m}^2/\text{s}$  and  $10^{-9} \text{ M}$ , respectively. The reaction time was 2 hours. Considering the turbulent flows of a target solution, 15 mm of the rotating disk was selected as the outermost position where the sensing substrate can be located. The result shows that the difference of bound target molecules between the sensing substrates at 0 and 3 mm are higher than the sensing substrate at 9 and 15 mm, which indicate the increase rate of bound target molecules is higher at the inner region of the disk than the outer region of the disk.*

**Figure S3**



**Figure S3.** Simulation results of shear rates. The rotating speed of a rotating disk was set to 150 rpm: (A) Shear rate distribution in a reaction chamber; (B) Shear rate distribution on a 10 nm-sized particle attached on 15 mm from the center of the disk.

**Figure S4**



**Figure S4.** Effect of different flow conditions on IL-13 antibody-antigen reactions under various pH conditions