Electronic Supplementary Material (ESI) for Lab on a Chip

Supporting information.

Rapid protein concentration, efficient fluorescence labeling and purification on a micro/nanofluidics chip

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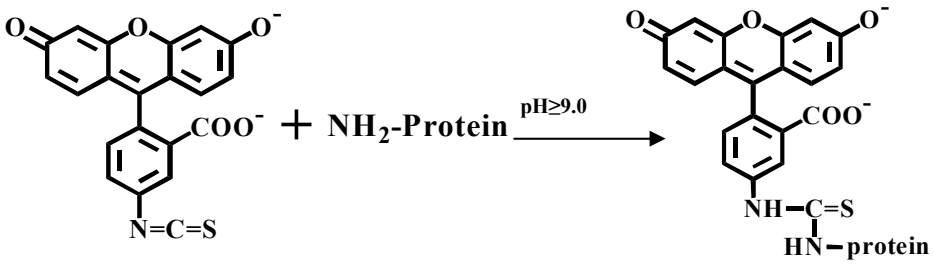

Scheme S1. Reaction scheme of FITC with amino residues of protein side chains. Left: FITC; green fluorescence. Right: FITC-protein conjugate; green fluorescence.

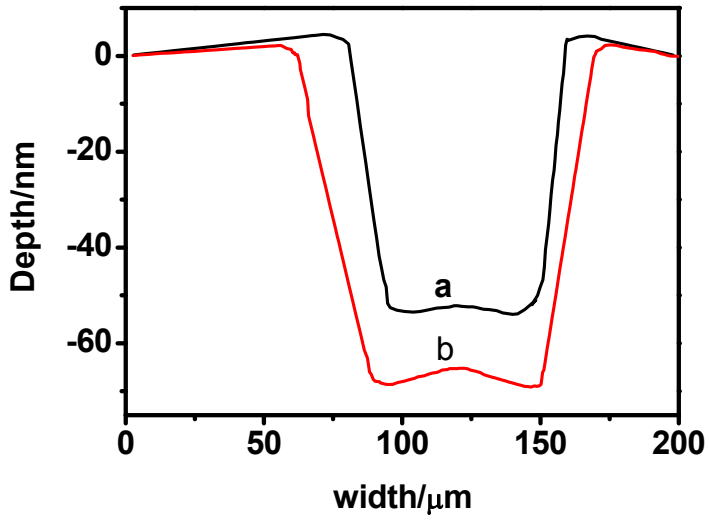

Figure S1. Depth profiles of the fabricated nanochannels on PC surfaces after 60-min (a) and 80-min (b) UV-irradiation through a photomask.

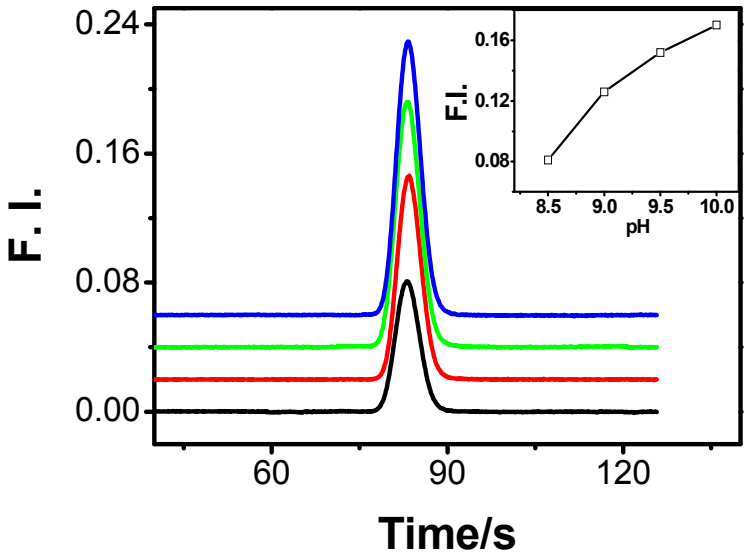

Figure S2. Micro/nanofluidics chip electropherogram of labeling product FITC-BSA after 300 s concetration, 600 s FITC flowing and 90 s purifcation processes in solutions with pH value of 8.5, 9.0, 9.5 and 10.0 (from bottom to top). The inset shows the influence of solution pH on labeling reaction efficiency.

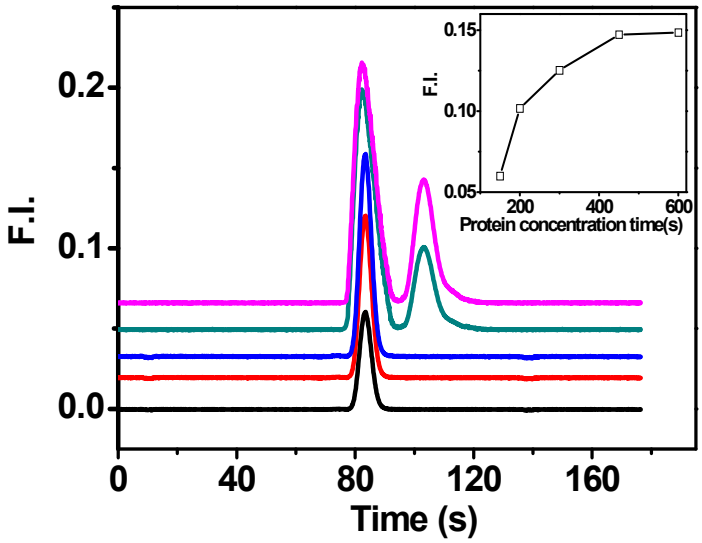

Figure S3. Typical electropherograms of the purified protein with different BSA concentration time. Concentration time (from bottom to top): 150, 200, 300, 450, and 600 s. The FITC flowing time: 600 s. The FITC-BSA peak appears at 83 s, and FITC at 103 s. The inset shows the plot of FITC-BSA fluorescence intensity versus protein concentration time. Reaction conditions: 100 μg/ml BSA (1.5 nM), 6 μg/ml FITC solution (15 nM) in 20 mM BCB solution (pH 9.0). The separation voltage was 1000 V.

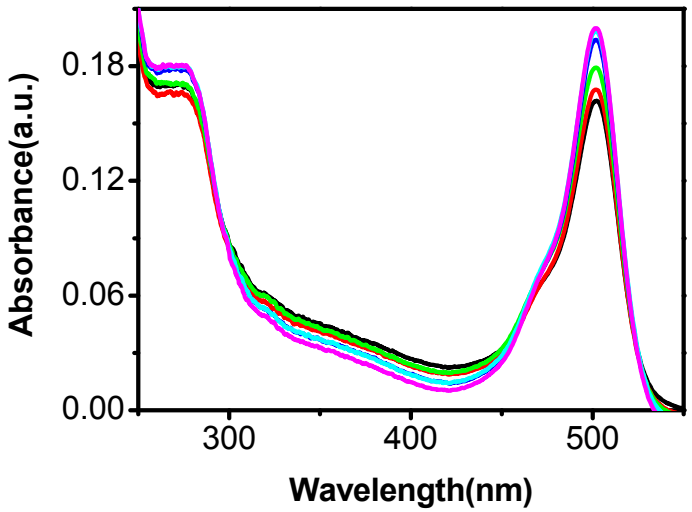

Figure S4. The reaction kinetics of BSA labeled with FITC in bath system. From bottom to top are 1 h, 2 h, 4 h, 6 h, 10 h, 14 h reaction time in the dark. Other reaction conditions: pH 9.0, temperature 25 ^{o}C, BSA concentration 100 μg/ml.

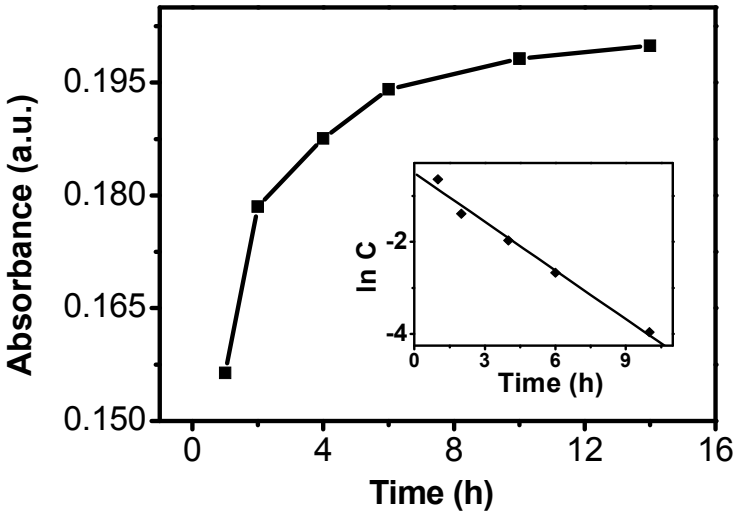

Figure S5. UV-vis absorbance intensity of the purified FITC-BSA product obtained from different labeling reaction time in bath system in the dark. The reaction was performed in a pH 9.0 buffer solution at 25℃. BSA concentration: 100 μg/ml. The inset shows the plot of the natural Logarithm of protein (BSA) concentration (lnC) as a function of reaction time (t).

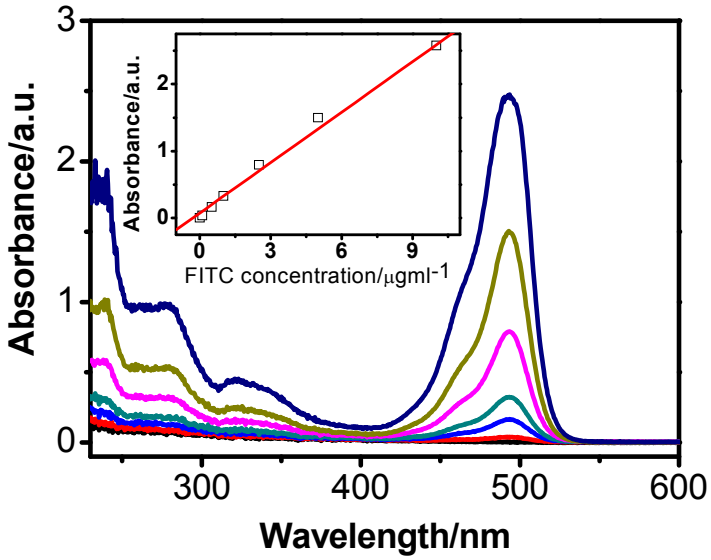

Figure S6. UV-vis spectra of FITC solutions with different concentration (from bottom to top: 0, 0.01, 0.05, 1, 2.5, 5, 10 μg/ml). The inset displays the calibration curve of FITC.

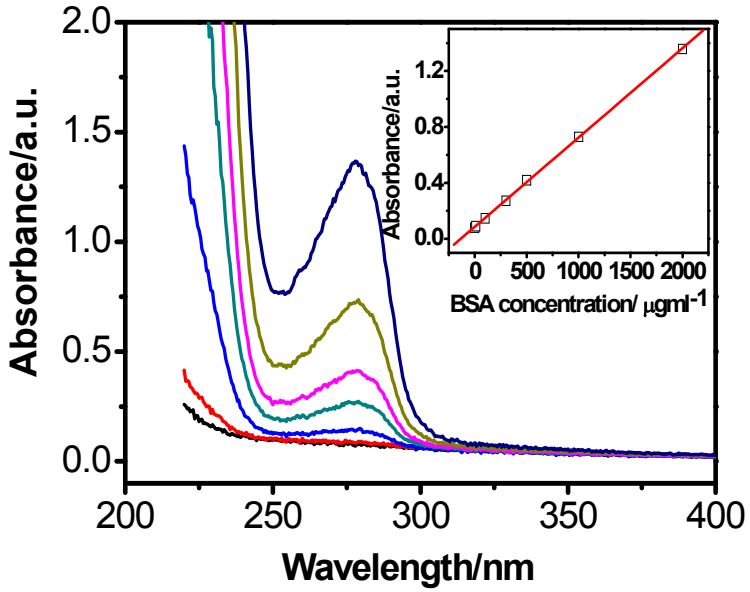

Figure S7. UV-vis spectra of BSA solutions with different concentration (from bottom to top: 0, 10, 100, 300, 500, 1000, 2000μg/ml). The inset shows the calibration plot of BSA.

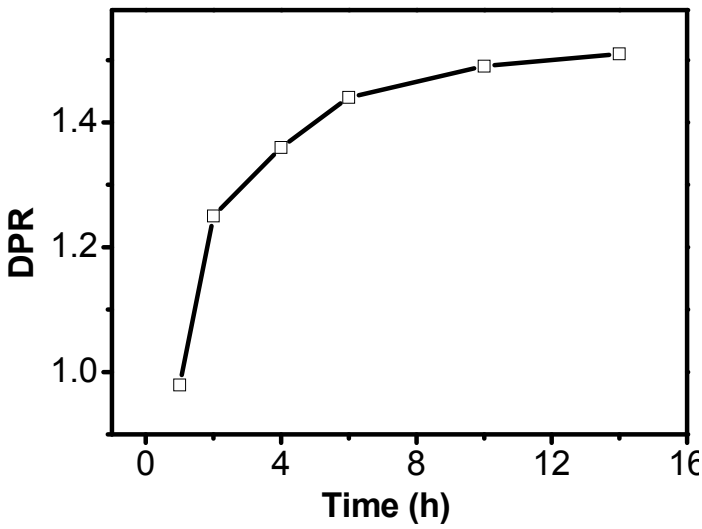

Figure S8. Plot of DPR values of FITC-BSA versus reaction time. Data were from Figure S4.

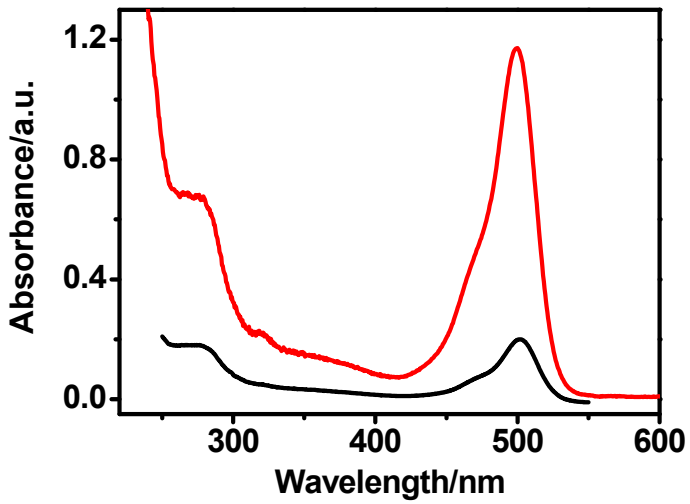

Figure S9. UV-vis absorbance spectra of the reaction product FITC-BSA synthesized from conventional bath system (black curve) and our micro/nanofluidics device (red curve).

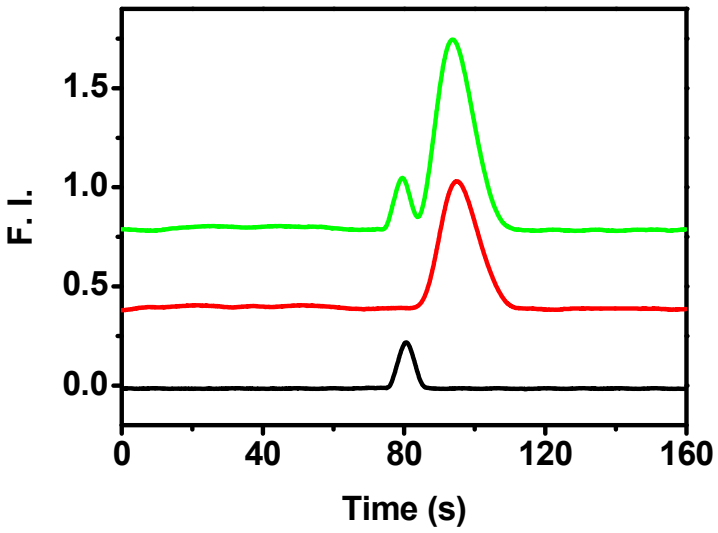

Figure S10. Electropherograms of IgG labeled with FITC on the micro/nanofluidics chip. Curves from bottom to top correspond to the purified product FITC-IgG, FITC, and unpurified reaction product (including FITC-IgG and unreacted FITC), respectively. Reaction conditions: 239 μg/ml IgG, 12 μg/ml FITC in 20 mM BCB solution (pH 9.0). The IgG concentration time: 300 s at 400 V, the reaction time at room temperature (FITC flowing time): 600 s, followed by purification time of 90 s. Separation voltage: 1000 V.

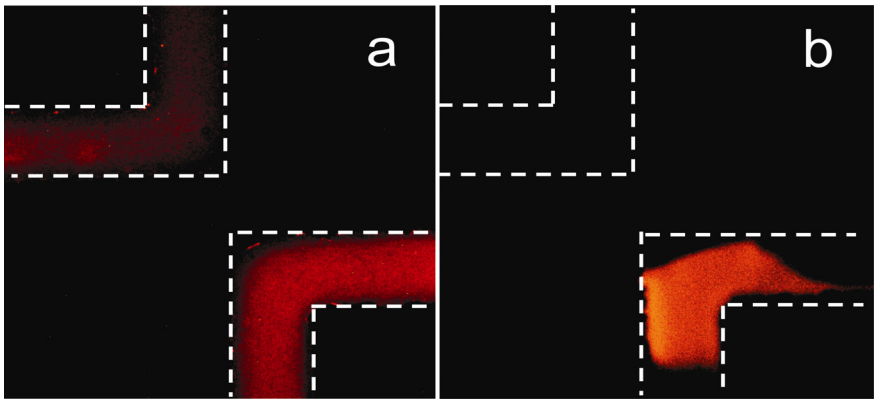

Figure S11. The photo images showing purification of the formed RBITC-BSA conjugates on the micro/nanofluidic device. Images were taken after buffer instead of RBITC solution was electrokinetically driven through the nanochannel for 30 s (a) and 90 s (b). Separation voltage: 1000 V applied at reservoirs 3 (anode) and 6 (cathode) as indicated in Figure 1A. Dotted lines indicate the outlines of the microchannels.