Supporting Information for

Selective Fabrication of Nanowires with High Aspect-Ratios using a Diffusion Mixing Reaction System for Applications in Temperature Sensing

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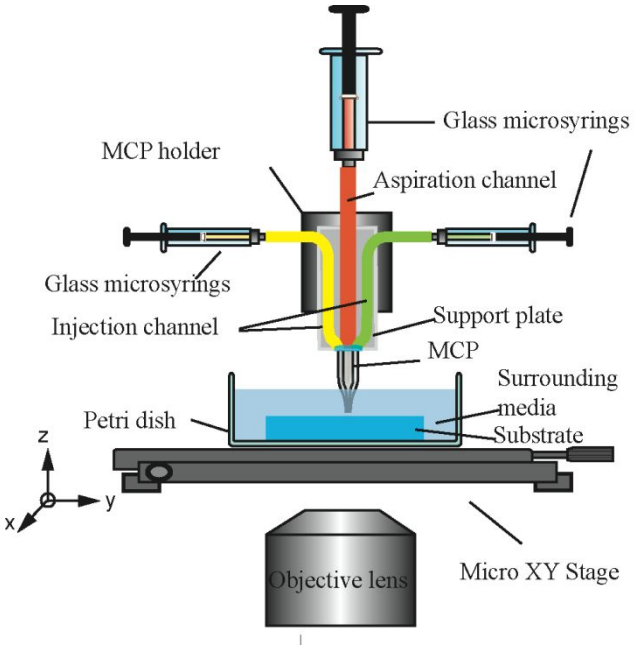

Figure S1. Schematic of diffusion mixing reaction system (DMRS).

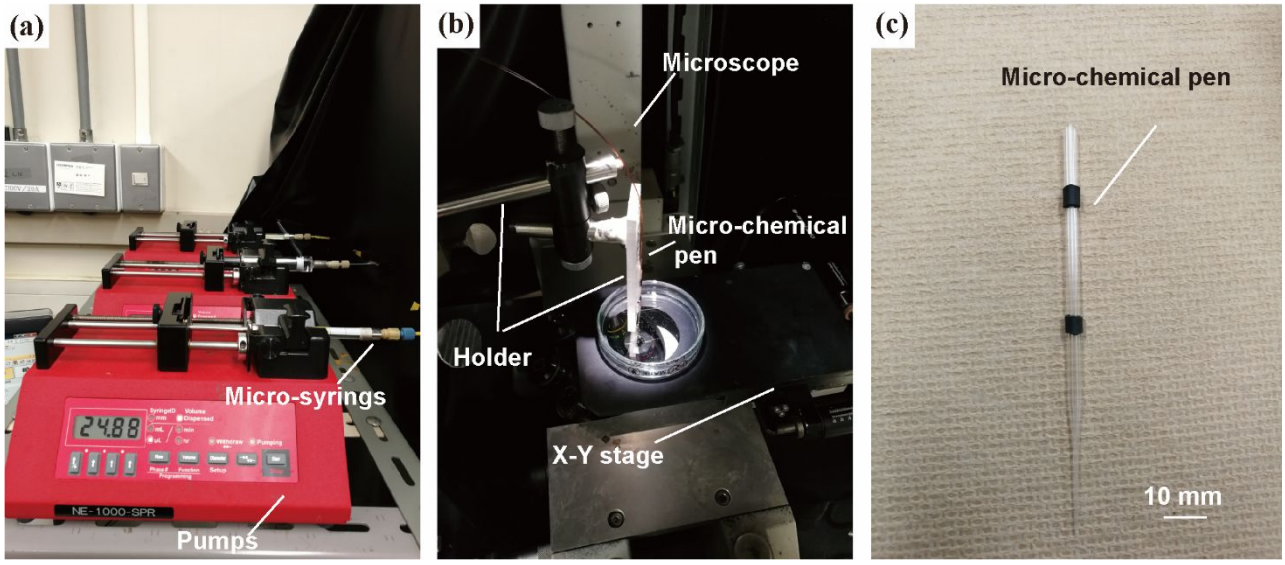

Figure S2. The setup of experimental system. (a) The micro-syringes and pumps, for use as a tool to inject sample into the micro-chemical pen (MCP). (b) The assemblage of MCP. (c) The digital picture of MCP.

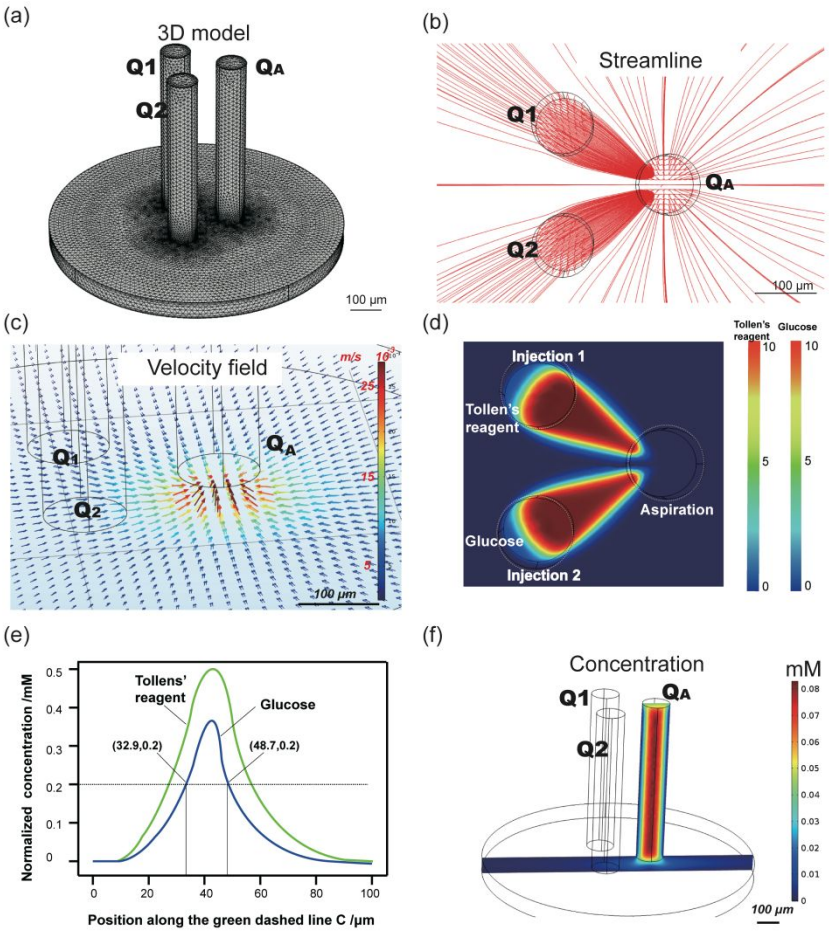

Figure S3. Numeric simulation of DMRS. (a) 3D model of DMRS. (b) Streamline. (c) Velocity field. (d) Concentration gradient distribution. (e) Concentration distribution along the green dash line C. (f) Concentration distribution at XZ flat in the simulation result.

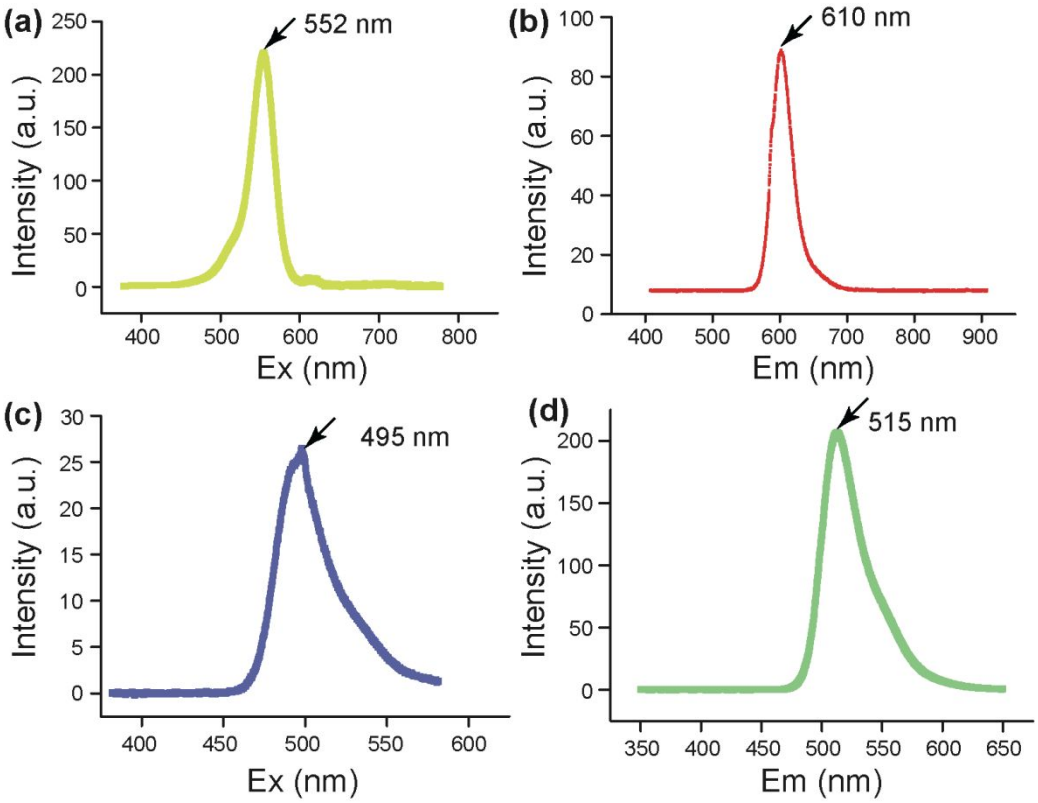

Figure S4. Excitation and emission spectra. (a) Excitation spectrum of rhodamin B. (b) Emission spectrum of rhodamin B. (c) Excitation spectrum of sodium fluorescein. (d) Emission spectrum of sodium fluorescein.

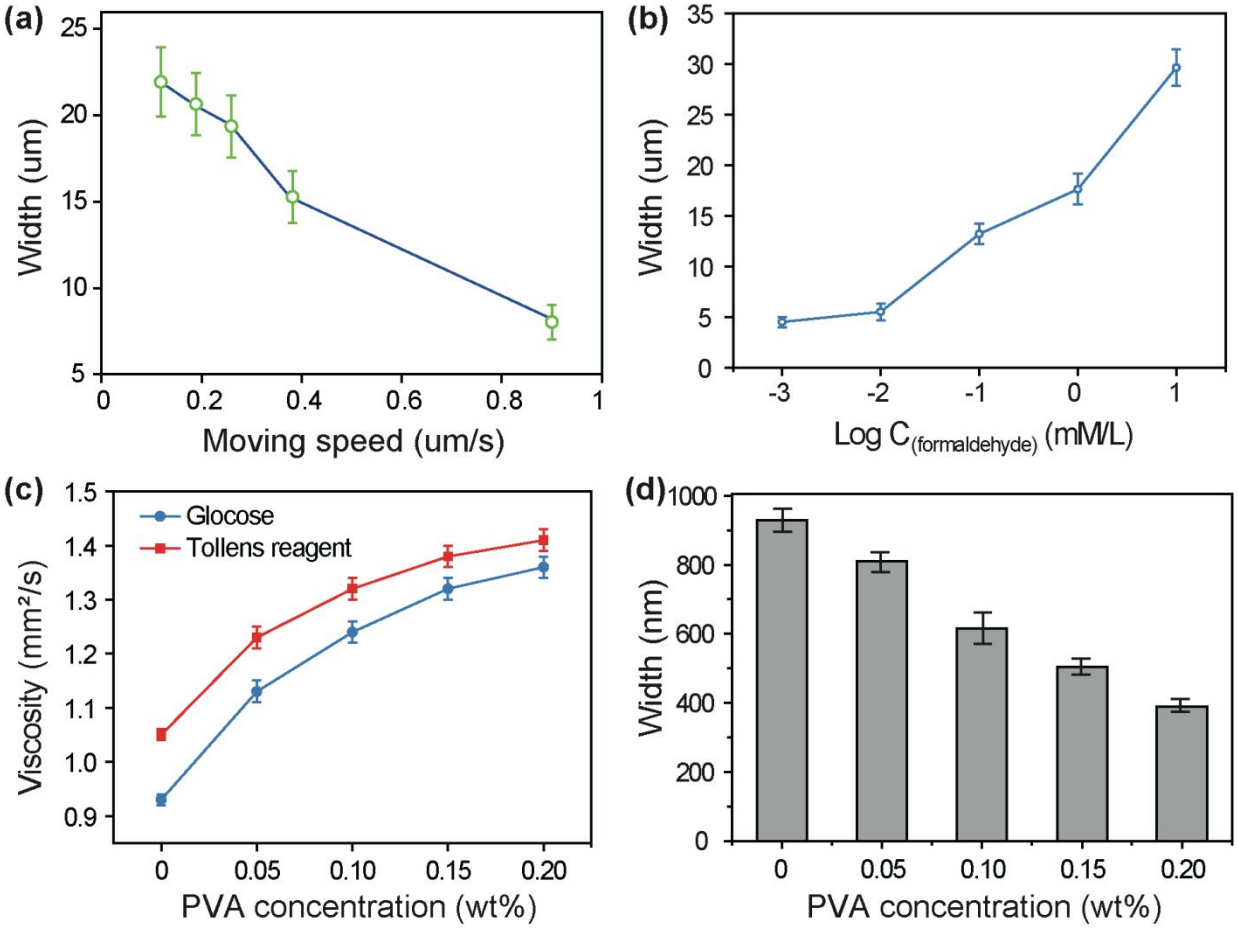

Figure S5. Optimizations of dominant parameters. (a) The widths of patterned silver wires under different moving speed of substrate. (b) The widths of patterned silver wires using different concentration of formaldehyde. (c) Viscosities of Tollens' reagent and glucose solutions by adding Polyvinyl Acetate (PVA). (d) The widths of patterned silver nanowires using injected solutions with various concentrations of PVA.

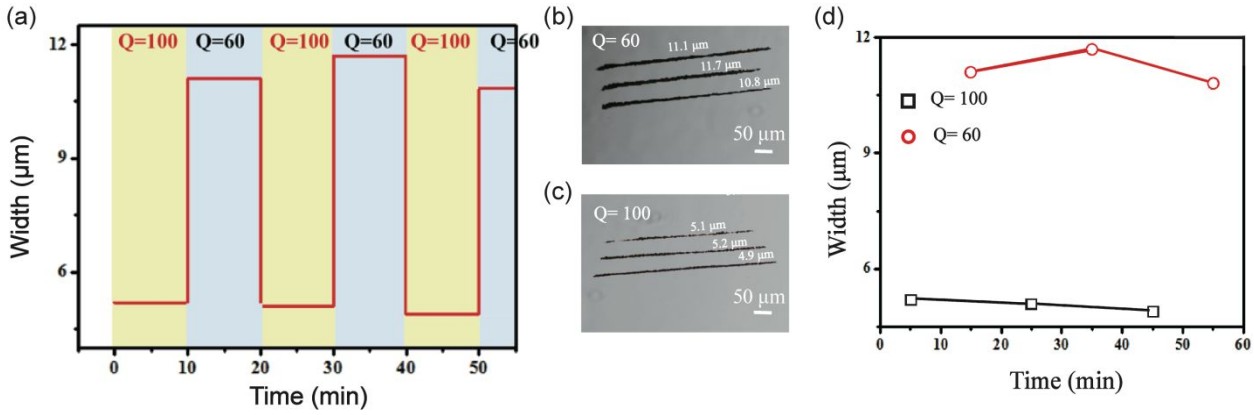

Figure S6. Fabrications of silver wires array. (a) The width of the Ag wires array with different Q. (b) Silver wires array at Q = 60. (c) Silver wires array at Q = 100. (d) Time with the width of silver wire arrays in parallel Q experiments.

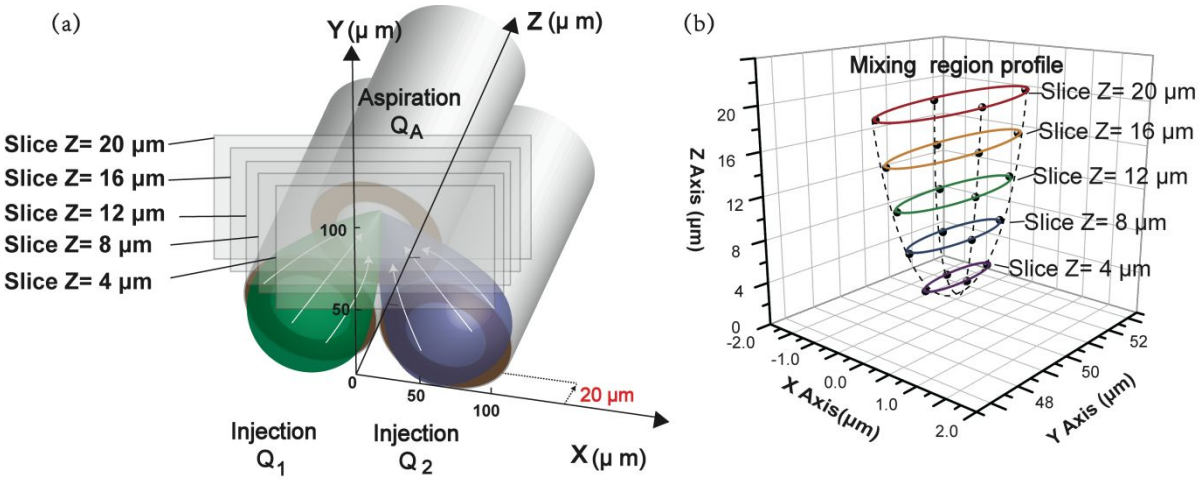

Figure S7. The simulation results of the geometric dimensions of the mixing region under different slice. (a) The coordinate values of those slices (X-Y direction) were Z=4, 8, 12, 16, 20 μm, respectively. The chemistry pen was supposed in a three-dimensional coordinate system, where the coordinates of the center point of the two injection apertures was (0, 0, 20).The flow rate of the chemical pen (50 μm i.d., 220um o.d.) was set as 35($Q=Q_A:Q_1=350:10$ ul/h). (b) The coordinates of contour of mixing region under different slices at a three-dimensional coordinate system obtained by simulation.

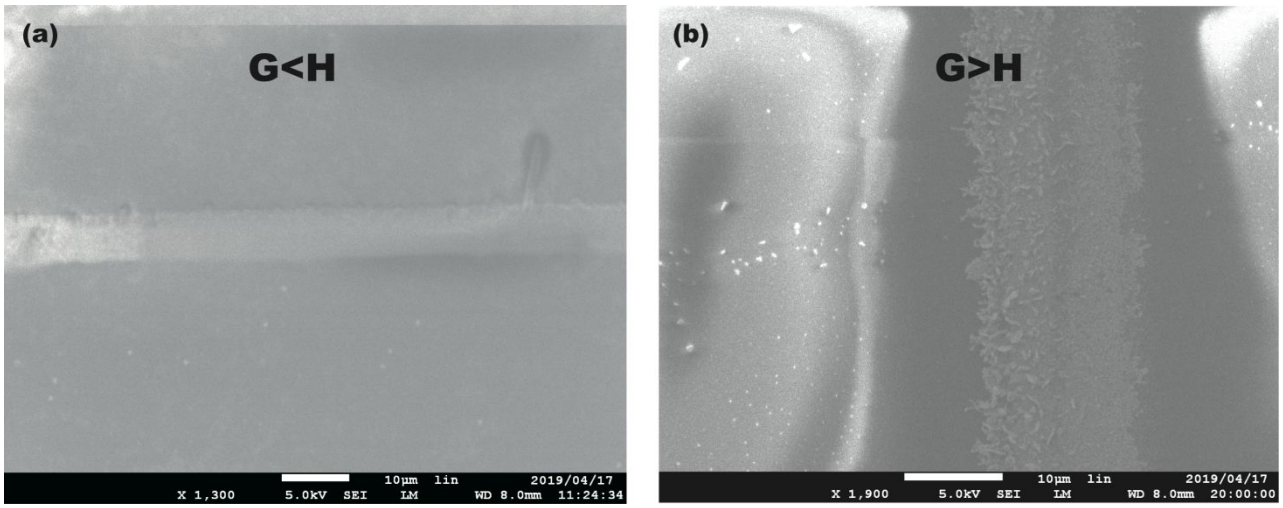

Figure S8. The difference in the quality of silver wires with different Gap value. H=20 μm. (a) The silver wire was fabricated when gap less than 20 μm (G<H). (b) The silver wire was fabricated when gap more than 20 μm. (G<H). It noted that the roughness of surface of silver wire (G>H) is larger than that of G<H.

Table S1. The width of the silver wire arrays with different Q and Gaps was parallelly fabricated.

Parameters	Value of parameters	Width (μm)	
		Average	RSD (% n=3)
Q	100	5.1	3.0
	60	11.0	4.1
Gap (μm)	60	29.1	4.5
	20	21.4	3.9

Table S2. The temperature dependent resistance of silver wire of preparing temperature sensor was measured under different temperature.

Temperature (℃)	Resistance (Temperature increase)		Resistance (Temperature decrease)	
	Average (Ω)	RSD(% n=3)	Average (Ω)	RSD(% n=3)
30.0	30.40	0.0802	30.44	0.0803
40.0	30.64	0.2411	30.58	0.2901
50.0	30.90	0.1397	30.94	0.2795
60.0	31.20	0.0288	31.20	0.3713
70.0	31.56	0.3727	31.47	0.2437