

Supplementary Material

Phosphoric acid induced controllable nanoparticle aggregation for ultrasensitive SERS detection of malondialdehyde in a microfluidic chip

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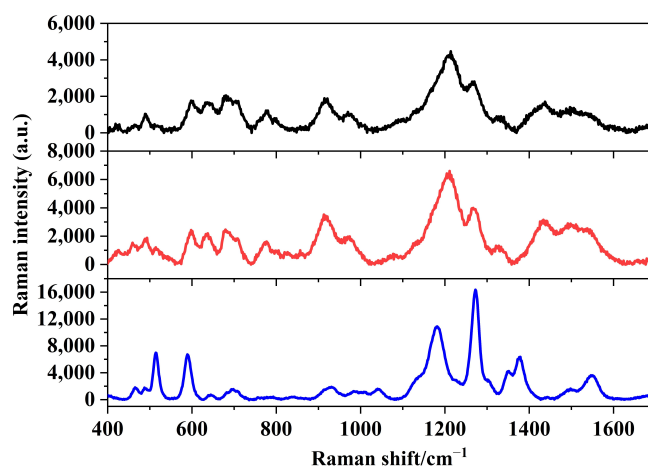


Figure S1 The collected SERS spectra (a) in the experiment of producing TBA-MDA inside the MAHSO chip; (b) standard TBA; (c) standard TBA-MDA .

Table S1 Correspondence between concentration of phosphoric acid injected to the chip, inside the chip and resulted final pH value.

Since the ratio of flow rate of central channel to side channels was 1:5:5, the concentration of phosphoric acid inside the chip was diluted by 11 times from the

injected phosphoric acid. The final pH value was measured from the solution flowing out the chip by commercial pH meter.

Concentration of injected phosphoric acid (mM)	Concentration of phosphoric acid inside the chip (mM)	Final pH value
0.022	0.002	5.8
0.22	0.02	4.7
2.2	0.2	3.8
22	2	2.7
110	10	2
220	20	1.6
2200	200	1

Equation (S1) Definition of SERS enhancement factor (EF)

The definition of SERS enhancement factor (EF) was chosen from analytical chemistry point of view and the analytical enhancement factor (AEF) was calculated according to the following formula:

$$AEF = \frac{I_{SERS}/(C_{SERS} * t_{SERS})}{I_{RS}/(C_{RS} * t_{RS})}$$

Where I_{SERS} and I_{RS} are intensities of same bands of the SERS spectrum and the normal Raman spectrum. C_{SERS} and C_{RS} are the concentrations of analyte solution probed in the SERS spectrum and normal Raman spectrum, respectively. t_{SERS} and t_{RS} are the integral times detected in the SERS spectrum and normal Raman spectrum, respectively. The normal Raman and SERS spectra are shown in Figure S2(a) and (b).

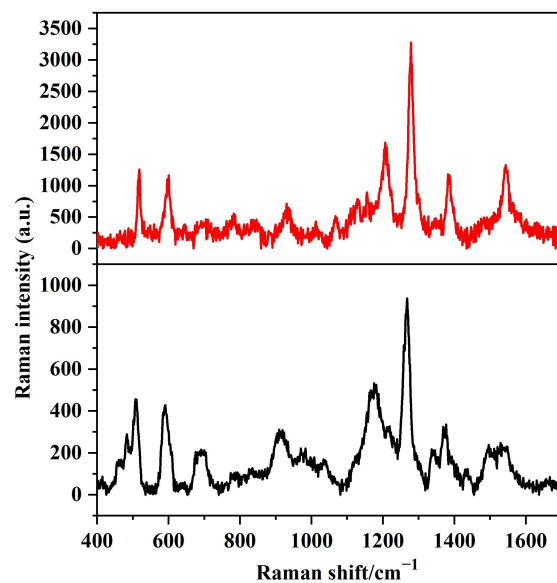


Figure S2 (a) The normal Raman spectrum of 3.3×10^{-3} M TBA-MDA acquired by dropping the solution on clean glass sheets for detection. The integral time was 10 s. (b) The SERS spectrum of 3×10^{-12} M of TBA-MDA acquired inside the chip. The integral time was 1 s.