Electronic Supplementary Information

Material and methods

1. Reagents and methods

UA and DA were from Alfa Aesar Chemical Company (Singapore). Other chemicals were from Beijing Chemical Works (Beijing, China). All chemicals were of analytical grade and all solutions were prepared with pure water obtained from Wahaha Group Co. Ltd. (Hangzhou, China). 0.1 M phosphate-buffered saline (PBS, pH 7.0) was prepared from K_2HPO_4, KH_2PO_4 and KCl. And all solutions containing UA, DA or AA were prepared with PBS. Human serum samples were provided by Peking University Hospital. All experiments were performed in compliance with the relevant laws and institutional guidelines, and were approved by the College of Chemistry and Molecular Engineering of Peking University.

Electrochemical measurements were performed with CHI 760 electrochemical workstation (Shanghai, China). All the electrochemical measurements were performed in a Faraday cage.

2. Fabrication of the biconical microchannel

The biconical microchannel was fabricated by the same procedure in our previous work using a CO_2-laser-based pipette puller (P-2000, Sutter Instrument Co., USA) with the quartz capillary (0.7 mm inner diameter and 1.0 mm outer diameter) from the same company of the puller[1]. The inner diameter of the narrowest section of the microchannel is around 70 μm and the length of the biconical section 0.5 cm.

3. Preparation of the disk CFE

The disk CFE was prepared as follows. First, the carbon fiber (7 μm in diameter, Goodfellow Co., U.K) was connected to a copper wire with silver paint. Then, nail polish was spread onto the carbon fiber and the end of copper wire. Last, after dried in air at room temperature, the tip of the coated carbon fiber was cut and a disk was exposed.

Detection of UA

1. Parameters

The disk CFE and the biconical microchannel did not undergo any modification and they were originally stable, which was contributing to the stability of the detection of UA in both PBS and human serum. The parameters of DPV in the detection of UA and that of the calibration curve for the DPV peak current versus UA concentration are listed below.

Table 1 Parameters of DPV in Fig. 3 and Fig.4

Incremental *E* / mV	Amplitude / mV	Pulse Width / s	Pulse Period / s	Sample Width / s
4	50	0.05	0.5	0.0167

Table 2 Parameters of the calibration curve in the inset of Fig. 4A

	Value	Standard Error
Intercept	0.01286	0.00556
Slope	0.41996	0.00989
R-Square	0.9956	

2. DPVs of human serum sample

DPV was implemented twice with an interval of 5 min (Fig. S1). As can be seen, there is hardly difference between the peak currents of the two curves. The results can prove the absence of an impact of solvent loss.

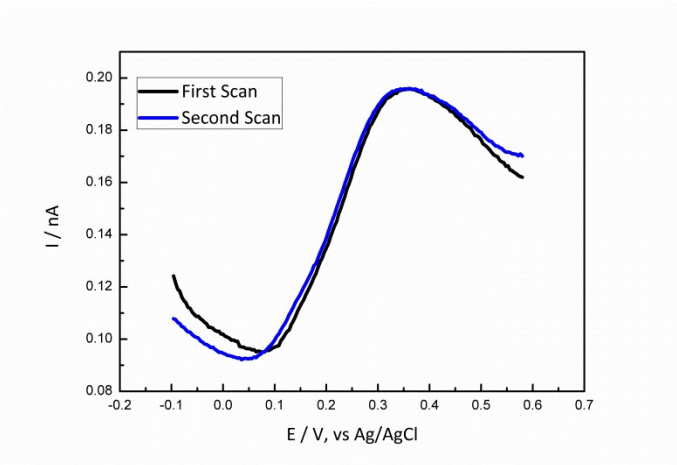

Fig. S1 Two DPVs of one human serum sample (volume 1 μL) in the biconical microchannel with an interval of 5 min. The parameters of DPV were the same as Table 1.

Reference

1. F. X. Chang, C. Chen, X. Xie, L. S. Chen, M. X. Li and Z.W. Zhu, *Chem. Commun.*, 2015, **51**, 15316-15319.