

Supporting information

A Novel Screen-Printed Electrode Array for Rapid High-Throughput Detection

Shuai Mu, Xiao Wang, Yuan-Ting Li, Yang Wang, Da-Wei Li, Yi-Tao Long*

State Key Laboratory of Bioreactor Engineering, Shanghai Key Laboratory of Functional Materials Chemistry & Department of Chemistry, East China University of Science and Technology, Shanghai, 200237, P. R. China. E-mail: ytlong@ecust.edu.cn; daweil@ecust.edu.cn

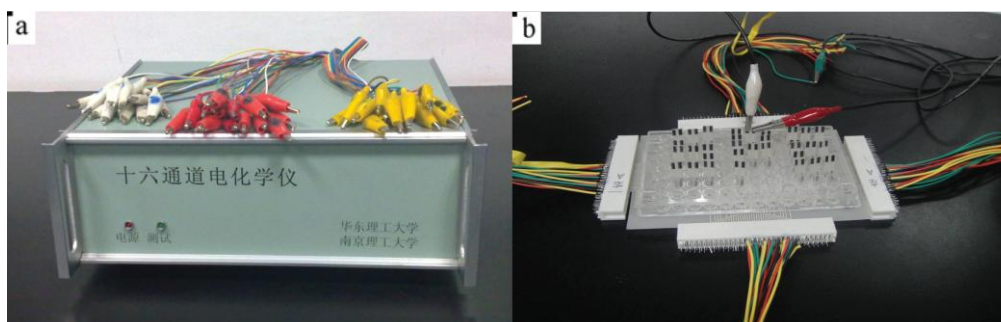


Fig S1. The photo of 16-channel electrochemical workstation (a). An example of the connection way of the sensing device with the electrochemical workstation (b).

Application program is developed based on Visual Studio VC++6.0 to realize the control and data storage of multi-channel electrochemical workstation. User interface is displayed as follows (Fig S2). On the top of the interface, there are two experimental methods for selection, which are cyclic voltammetry and amperometry. In the middle of the interface, we can set the parameters. In the lower right corner, there are three state buttons and a control bar.



Fig S2. User interface of 16-channel electrochemical workstation

Table S1. Function of buttons on the user interface

Buttons	Function
Cyclic voltammetry	Click the button to set the parameters of CV
Amperometric It Curve	Click the button to set the parameters of It
File Path	Select the save path of experimental results
Setting	Set parameters
Start	Start electrochemical instrument to work
Stop	Stop current wok of the electrochemical instrument

Instruction for use

Take CV measurement as an example. When the instrument is connected with PC through the USB connector, the instrument will begin self-test. At this time, any operation can not be carried out. The self-test procedure is displayed as follows

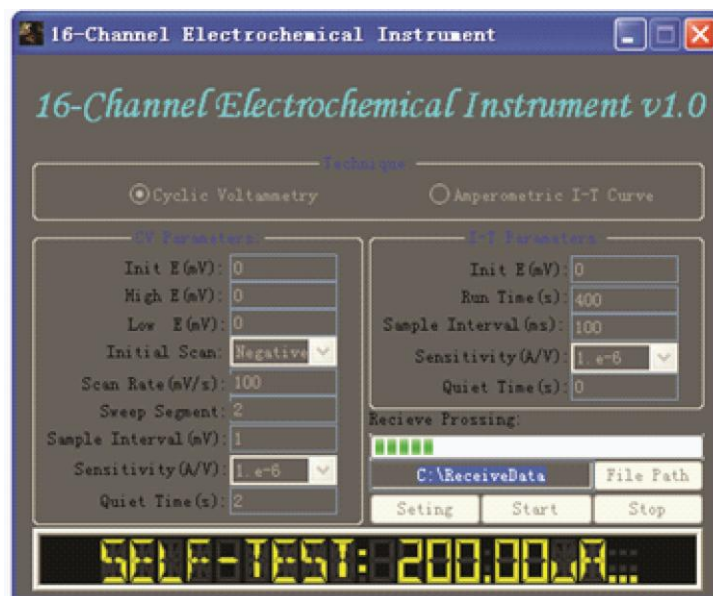


Fig S3. Self-test procedure of the instrument

After self-test, interface is shown below:

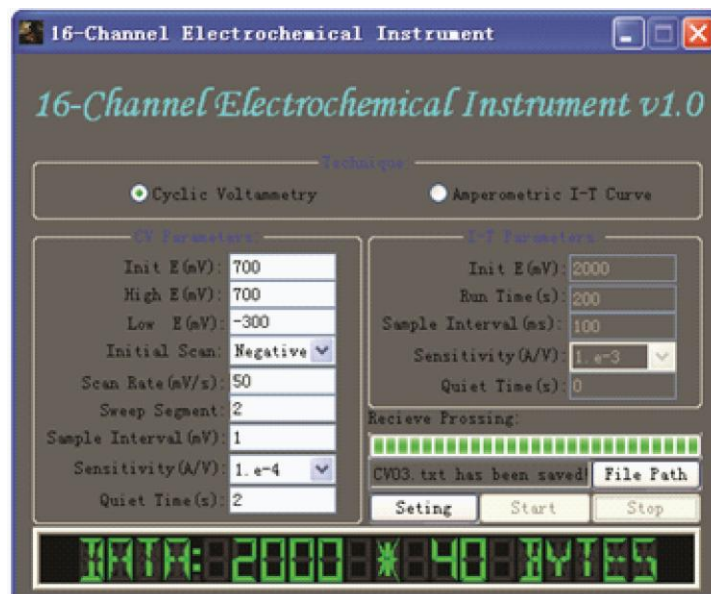


Fig S4. Measurement process

Select “Cyclic voltammetry” in the column “technique”. Then, according to characteristics of samples, filling in the appropriate parameters (“Init E”, “High E”, “Low E”, “Initial Scan”, “Scan Rate”, “Sweep Segment”, “Sample Interval”, “Sensitivity” and “Quit Time”) in the column “Cyclic voltammetry”. After completion of parameter settings, clicking the button “Setting”. Then, clicking the button “start”, the electrochemical workstation begins to work. Meanwhile, we can observe the condition of data reception in the column “Receive Crossing”. After the experiment, data will be automatically stored in the specified path.

Effect of the scan rate

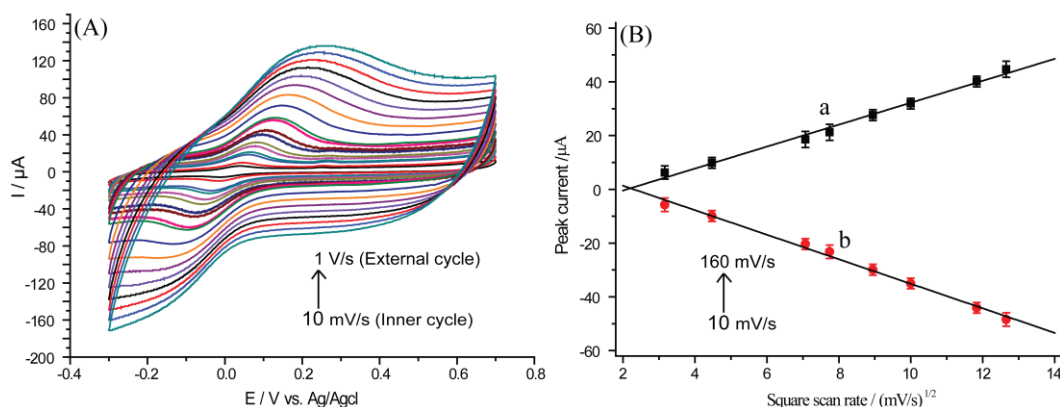


Fig S5. A. Cyclic voltammograms of DA (1mM) in pH 7.0 PBS at a scan rate of 10, 20, 50, 60, 80, 100, 120, 140, 160, 180, 200, 300, 400, 500, 600, 700, 800, 900, 1000 mV/ s. B. The relationship between the peak currents and the square root of scan rates from 10 to 160 mV/s. a: oxidation peak current of DA, b: reduction peak current of DA.

The scan rate dependence of CV for the MWCNTs-doped SPE was studied in the pH 7.0 PBS containing 1 mM DA. As shown in Fig S5, it could be found that the oxidation and reduction peak potentials shift slightly to a more positive value and a

more negative value with the increase of scan rate, respectively. Meanwhile, the oxidation and reduction peak currents of DA at the MWCNTs-doped SPE increase linearly with the square root of scan rate ($v^{1/2}$) in the range from 10 to 160 mV/s. The regression equations and correlation coefficients for these lines are $I (\mu\text{A}) = 4.08v^{1/2} [(mV s^{-1})^{1/2}] - 8.61$, $R=0.995$ for the oxidation peak current, $I (\mu\text{A}) = -4.56v^{1/2} [(mV s^{-1})^{1/2}] + 10.50$, $R=0.997$ for reduction peak currents, respectively. This means that the electrochemical oxidation of the DA is a diffusion-controlled process.

It should be noted that the redox of DA on the electrode is a quasi-reversible process which will enlarge the full width at half maximum, and meanwhile, the linear relationship between peak current and $v^{1/2}$ will deviate at a relatively high scan rate. In addition, since the existence of the uncompensated solution resistance, the ΔE_p value will also be enlarged at faster scan rates, hereby the reduction peak could not be observed within the applied scan potential window of -0.3~0.7V at a higher scan rate than 200 mV/s.