Electrochemical Sensing of Hepatocyte Viability

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Supplemental material：

The screen- printing carbon electrodes used in this work were pretreated in 0.1 M phosphate buffer with pH 7.4 by cyclic voltammetry at a voltage range of -0.6 V ~1.8 V (vs. Ag/AgCl reference electrode) and a scan rate of 0.1 V/s for 20 cycles. The reproducibility of electrodes was characterized using 5.0 mM ferricyanide in 0.1 M phosphate buffer by cyclic voltammetry. The results are showed in Fig S1, the reproducibilities (n=3) were 3.4% and 3.0 % for anodic peak current and cathodic peak current, respectively.

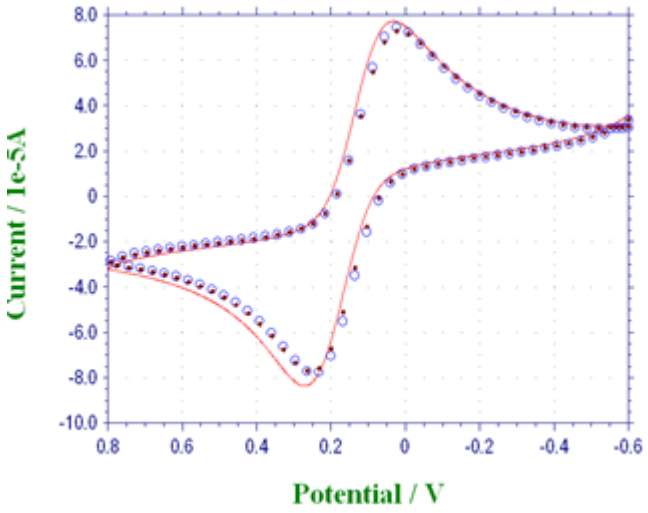
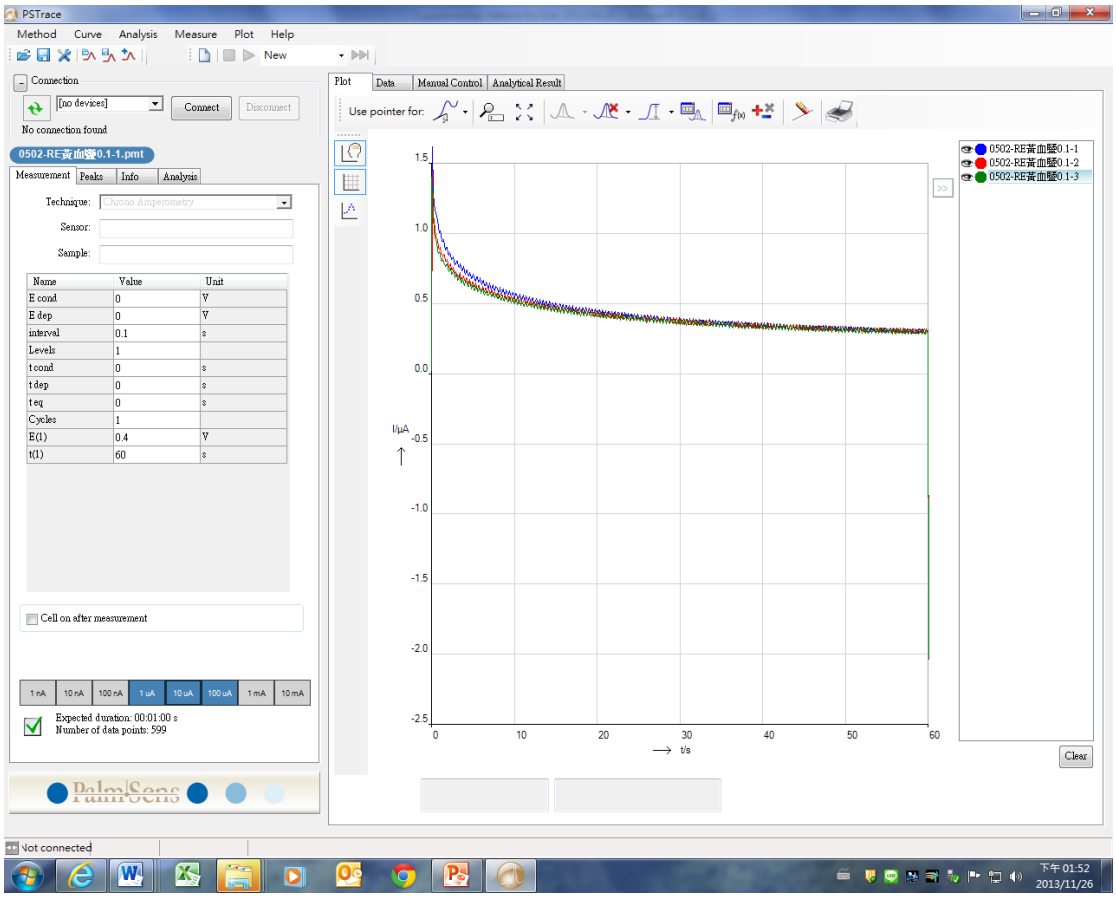


Fig S1. The cyclic voltammograms (CVs) of 5.0 mM ferricyanide ($K_3Fe(CN)_6$) in 0.1 M phosphate buffer with a pH of 7.4. The three CVs were measured with three different screen-printing carbon electrodes.

(a)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0502-RE黃血鹽0.1-1.pmt
Measurement
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E cond
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interval
0.1
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1
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s
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s
t eq
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s
Cycles
1
E(1)
0.4
V
t(1)
60
s
Cell on after measurement
1 nA
10 nA
100 nA
1 uA
10 uA
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1 mA
10 mA
Expected duration: 00:01:00 s
Number of data points: 599
Plot
Data
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Use pointer for:
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0502-RE黃血鹽0.1-2
0502-RE黃血鹽0.1-3
I/µA
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(b)

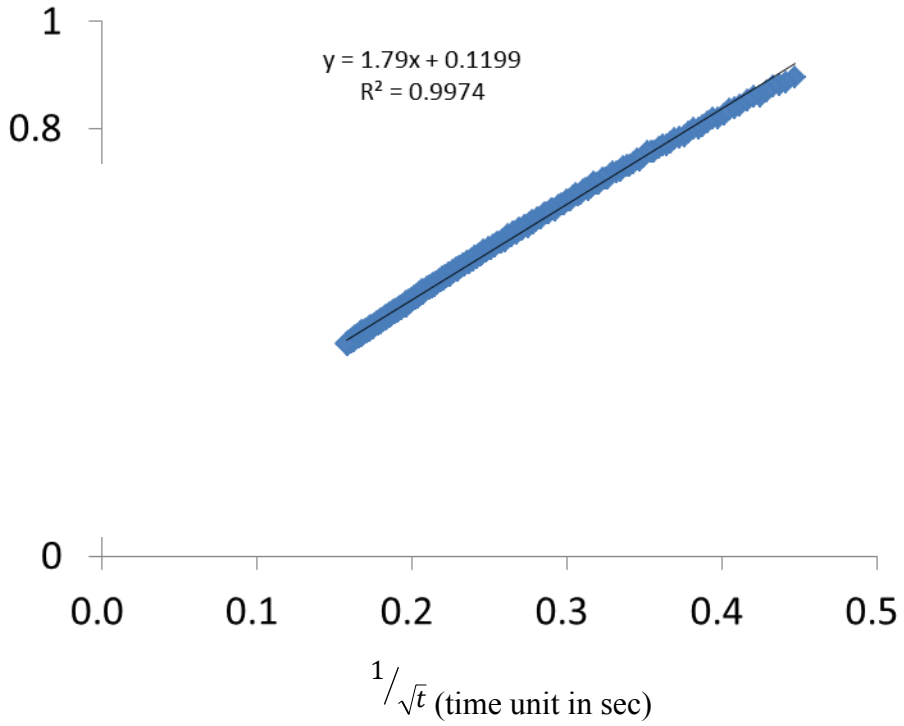


Fig S2: (a) The original (raw) data traces of three repeated chronoamperometric measurements. The sample was 0.1 mM ferrocyanide ($K_4Fe(CN)_6$) prepared in the William E medium contained 10 mM ferricyanide and 5 mM succinate. The current responses were monitored as a function of time after the potential of the working electrode is stepped (0.4 V vs. pseudo Ag). The chronoamperograms were the responses of measurements with different screen-printed electrodes. (b) According to Cottrell equation, the faradic current of chronoamperometry is proportional to $1/\sqrt{t}$. The plot of oxidation currents versus $1/\sqrt{t}$ during the time periods of 5~45 s had a good linearity (R^2=0.9974). This indicated that there was no interference of nonfaradic current at the time period. Thus, the charges were integrated from 5 to 45 s.

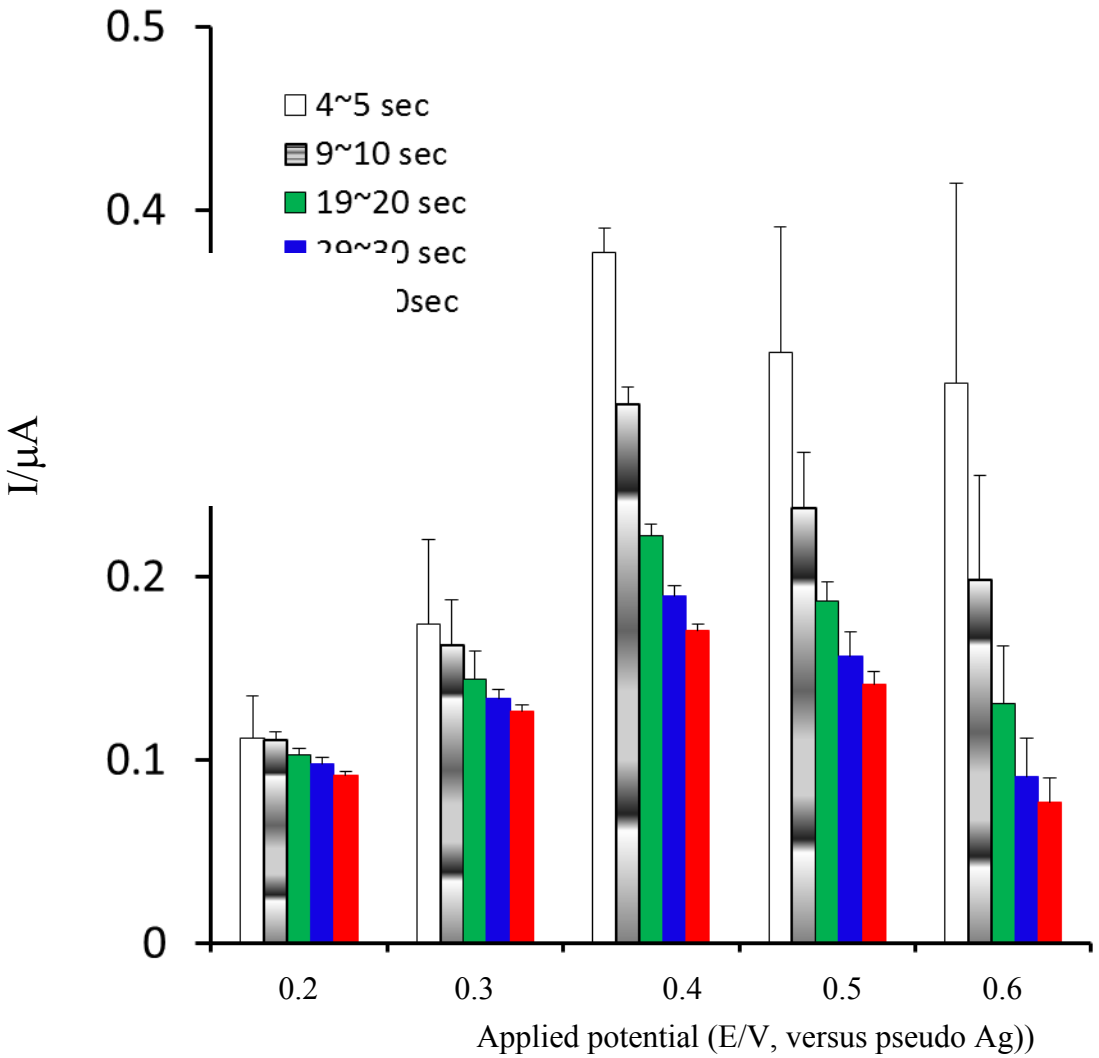
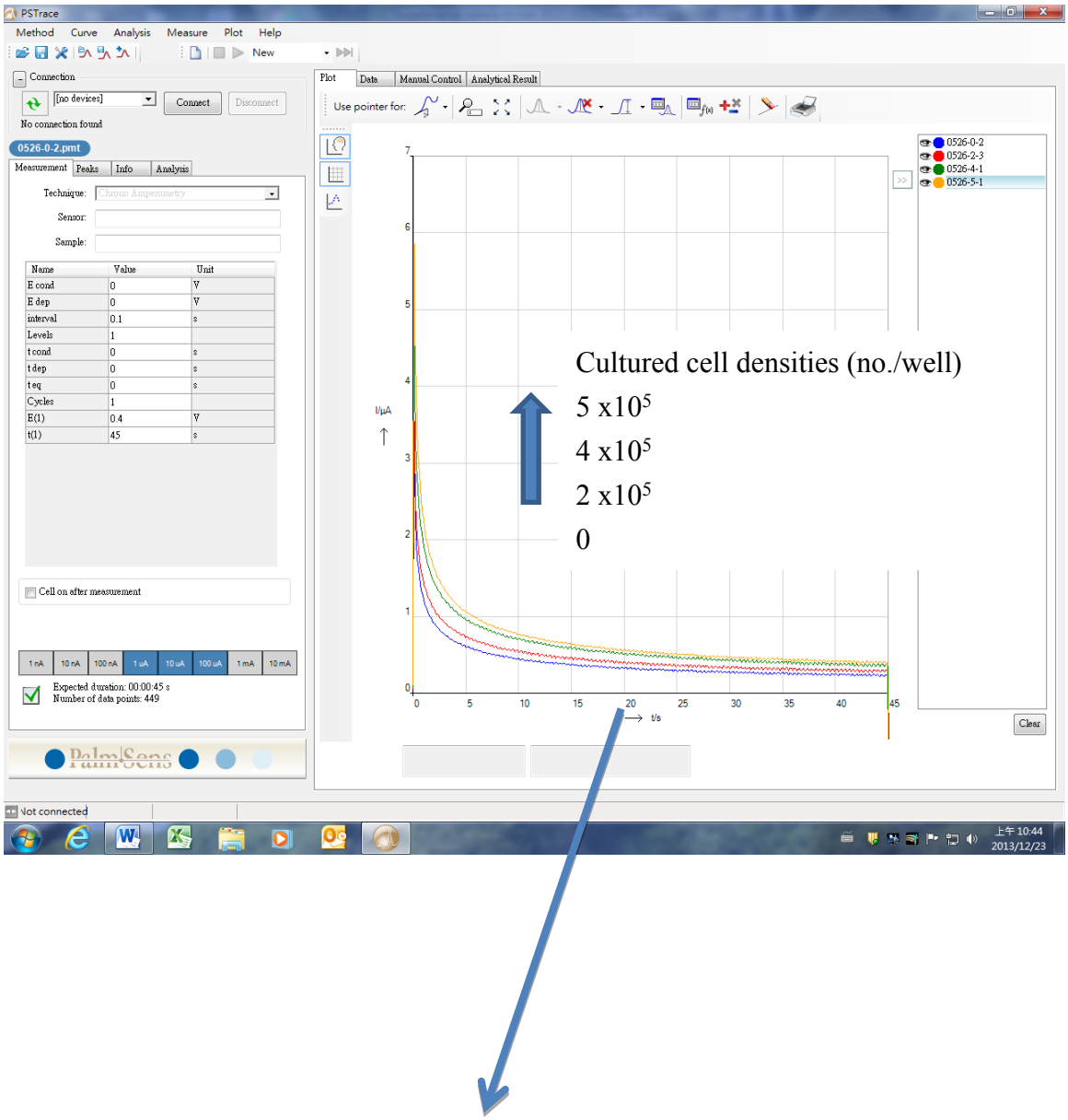


Fig S3: The chronoamperometric current response of 0.1 mM ferrocyanide ($K_4Fe(CN)_6$) prepared in the William E medium contained 10 mM ferricyanide and 5 mM succinate. The chronoamperometric responses were recorded by PSTrace system at 0.1 s interval. The signals were exported as text file; the 10 data of 1 s interval were averaged for different periods. Better signals were presented for all different time intervals when the electrode potential of 0.4 V (versus pseudo Ag).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Measurement
Peaks
Info
Analysis
Technique:
Chrono Amperometry
Sensor:
Sample:
Name
Value
Unit
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V
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0
V
interval
0.1
s
Levels
1
t cond
0
s
t dep
0
s
t eq
0
s
Cycles
1
E(1)
0.4
V
t(1)
45
s
Cell on after measurement
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10 nA
100 nA
1 uA
10 uA
100 uA
1 mA
10 mA
Expected duration: 00:00:45 s
Number of data points: 449
PalmSens
Plot
Data
Manual Control
Analytical Result
Use pointer for:
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0526-2-3
0526-4-1
0526-5-1
I/µA
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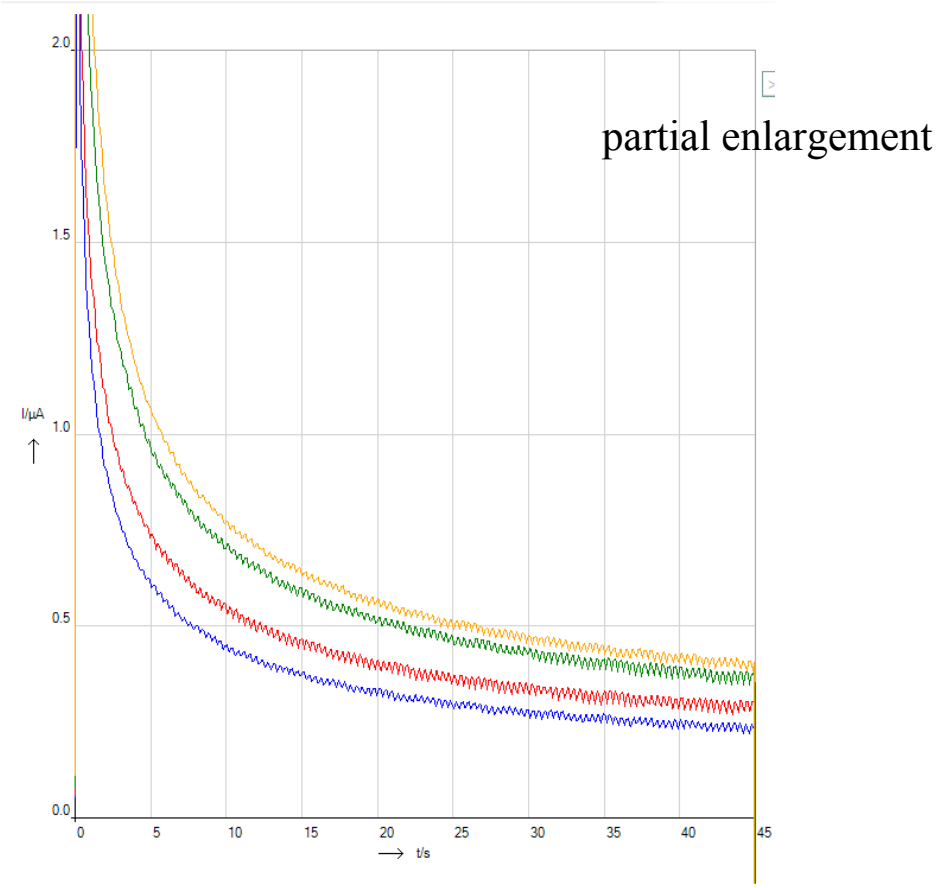

Fig S4: The chronoamperograms of measurements of various primary rat hepatocyte densities. Chronoamperometric measurements were conducted using a potentiostat (EmStat) and data acquisition was performed using PSTrace software. The ingredients of culture mediums were complicate and some of the components were electroactive, such as ascorbic acid. The potassium ferricyanide used in these experiment was BioUltra grade, containing hexacyanoferrate(II) ($\leq$200 mg kg^{-1}). Therefore, the blank solution that contained culture medium, ferricyanide, and zero cells presented some background currents.

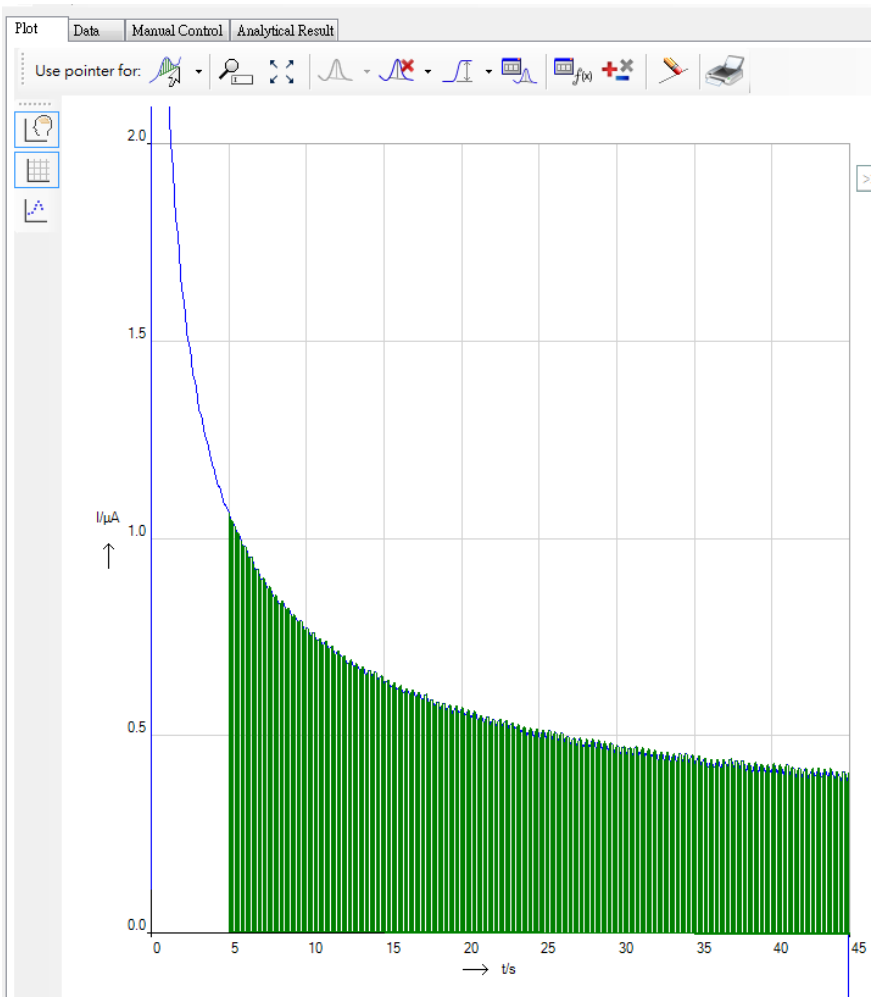

Fig S5: The response currents were integrated from 5s~45s by Emstat software.