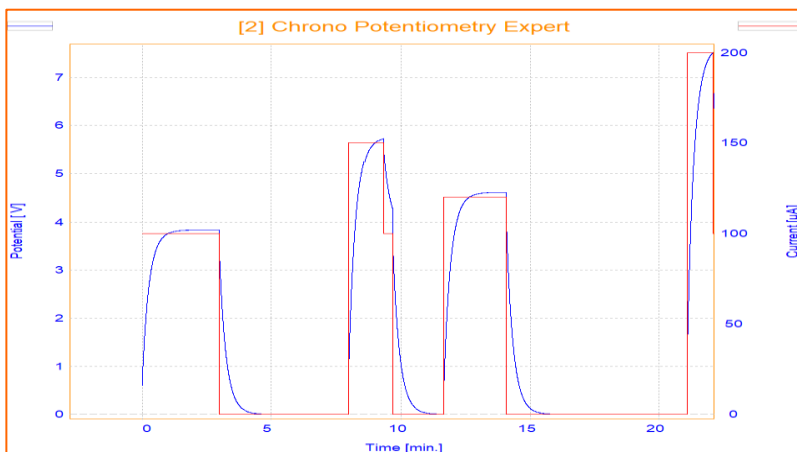


General Electrochemistry AP-GE07



Chrono Potentiometry Expert



This Application Note describes how the Chrono Potentiometry Expert method works by giving an example with a "r + R/C" cell:

- $r = 5.6 \text{ K}\Omega$
- $R = 33 \text{ K}\Omega$
- $C = 470 \text{ }\mu\text{F}$



Introduction

Chrono Potentiometry Expert is a very useful and easy method in OrigaMaster 5 software. In single chrono potentiometry, a single current step is imposed. The potential is recorded while the WORK current is maintained at a constant value. Information about the properties of different samples like different kind of capacitors can be obtained then.

In Chrono Potentiometry Expert, there are more than one steps (maximum 8 steps) which can be defined with different parameters (Figure 1). In each steps the positive or negative current can be imposed in different durations. All the defined steps can be repeated through definition of numbers of cycles as many time as user wants.

	Value	Unit	Duration	Unit	Meas. Period
<input checked="" type="checkbox"/> Level 1	100	µA	3	min.	0.1 Sec.
<input checked="" type="checkbox"/> Level 2	0	µA	5	min.	0.1 Sec.
<input checked="" type="checkbox"/> Level 3	150	µA	80	sec.	0.1 Sec.
<input checked="" type="checkbox"/> Level 4	100	µA	20	sec.	0.1 Sec.
<input checked="" type="checkbox"/> Level 5	0	µA	2	min.	0.1 Sec.
<input checked="" type="checkbox"/> Level 6	120	µA	145	sec.	0.1 Sec.
<input checked="" type="checkbox"/> Level 7	0	µA	7	min.	0.1 Sec.
<input checked="" type="checkbox"/> Level 8	200	µA	1	min.	0.1 Sec.

All levels : [dropdown] All levels : [dropdown]

OK Cancel

Figure 1: Chrono Potentiometry Expert

Parameters

The Parameters of the Chrono Potentiometry Expert is shown in figure 2.

Chrono Potentiometry Expert	
Current steps	8/100/µA/3/min./0.1/1/0/µA/5/min./0.1/1/150/µA/...
Cycle	5
Maximum potential (mV)	15000
Minimum potential (mV)	-15000
Analog Filter	Auto
Open circuit at end	Yes
Auxiliary input	No

Figure 2: The parameters

By clicking on Current Steps, the «current steps» window will be opened, and different steps of currents can be defined in this window (figure 3). It can be performed as single chrono if only one step be chosen.



Current Steps

	Value	Unit	Duration	Unit	Meas. Period	
<input checked="" type="checkbox"/> Level 1	100	μA	3	min.	0.1	Sec.
<input checked="" type="checkbox"/> Level 2	0	μA	5	min.	0.1	Sec.
<input checked="" type="checkbox"/> Level 3	150	μA	80	sec.	0.1	Sec.
<input checked="" type="checkbox"/> Level 4	100	μA	20	sec.	0.1	Sec.
<input checked="" type="checkbox"/> Level 5	0	μA	2	min.	0.1	Sec.
<input checked="" type="checkbox"/> Level 6	120	μA	145	sec.	0.1	Sec.
<input checked="" type="checkbox"/> Level 7	0	μA	7	min.	0.1	Sec.
<input checked="" type="checkbox"/> Level 8	200	μA	1	min.	0.1	Sec.

All levels : All levels :

OK Cancel

Figure 3: In « Current Steps » window, different steps of current can be defined

By the following parameters, the 8 steps (levels) of chrono potentiometry is defined:

- In Level 1, the imposed current is 100 μA in **3 minutes**.
- In Level 2, the imposed current is 0 in **5 minutes**.
- In Level 3, the imposed current is 150 μA in **80 seconds**.
- In Level 4, the imposed current is 100 μA in **20 seconds**.
- In Level 5, the imposed current is 0 in **2 minutes**.
- In Level 6, the imposed current is 120 μA in **145 seconds**.
- In Level 7, the imposed current is 0 in **7 minutes**.
- In Level 8, the imposed current is 200 μA in **1 minutes**.

NOTE: Duration of imposed current can be defined as **milli second** too, but it must be payed attention that the **Meas. Period** must be less than the duration, for example 0,0005 second is appropriate.



Figure 4 shows the result of the test. 8 steps Chrono Potentiometry are achieved.

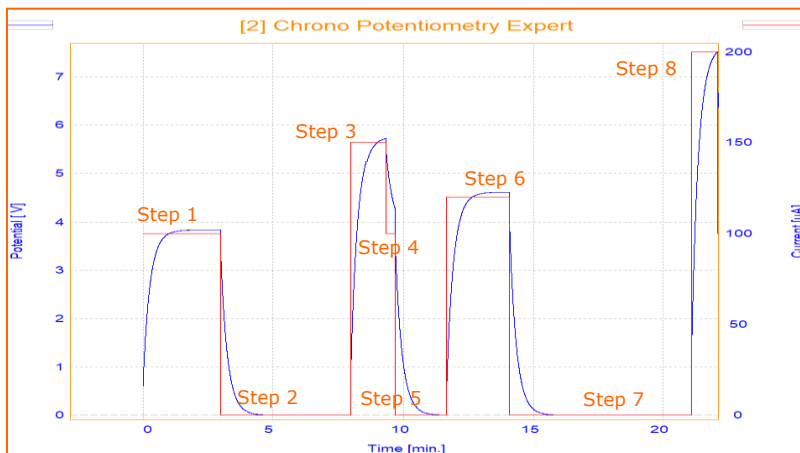


Figure 4: 8 steps Chrono Potentiometry

All the steps can also be repeated by defining the cycle number. Figure 5 shows another Chrono Potentiometry Expert's curve which is repeated in 5 cycles.

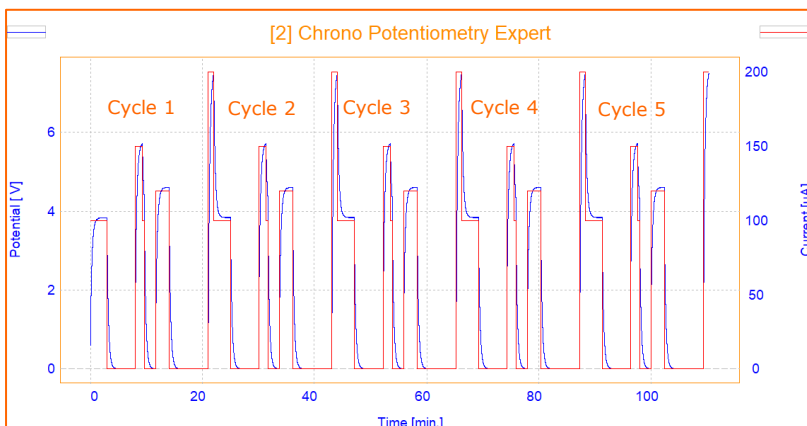


Figure 5: 5 cycles of Chrono Potentiometry done by Chrono Expert Method



NOTE: If the user wants to run this test on battery limits sample, it is very important to define the potential limits in "Start" box.
For more information, please read the application note of "Expert Charge Discharge".

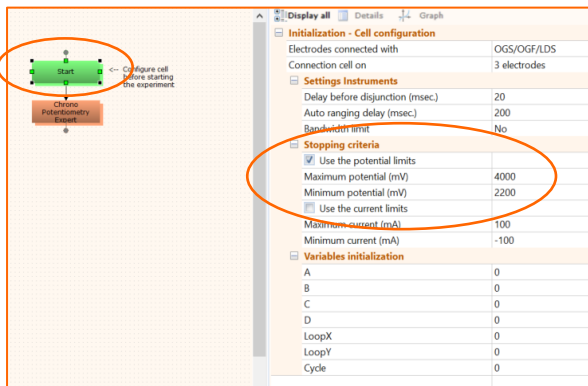


Figure 6: Defining the potential limit in Start menu

Instrument and Electrodes



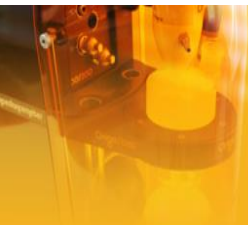
Figure 7: OrigaFlex OGF500

Electrode setup

Sample	Capacitor (35 V, 470 μ F) Two resistors: 5.6 K Ω and 33 K Ω
Instrument	OrigaFlex OGF500
Software	OrigaMaster



Figure 8: Sample



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