

General Electrochemistry AP-GE16



Chronoamperometry study on Ferri/Ferro Cyanide solution using RDE combined with the OrigaSwitch



OrigaSwitch is an external module connected directly to potentiostat (for OrigaStat) or to the OrigaBox (for OrigaFlex), allowing the user to toggle on/off the rotation of the RDE by pressing on the foot switch which could be put on the floor.



INTRODUCTION

The rotation speed of the Rotating Disk Electrode can be controlled thanks to the *OrigaBox Interface* software or the "RDE...OrigaTrod" sequence element in OrigaMaster software.

OrigaSwitch is a new external module useful in specific situations like working in "Gloves box" , or while your hands are occupied while it is not possible to start/stop the rotation by hands.

In this case, OrigaSwitch let users to set on/off the rotation of RDE by pressing a foot toggle switch pedal.

This application, illustrates how it works by performing a Chrono-amperometry.

During this test, by pressing OrigaSwitch, the measurement is performed, first at 2000 rpm rotation speed, and, pressing a second time, with RDE stopped.

In this application note, chrono amperometry method was run on Platinum electrode connecting to OrigaTrod.



Figure 1: OrigaSwitch which works by connecting to OrigaBox and RDE



Hardware Setup for OrigaFlex

For connecting the OrigaSwitch to OrigaFlex potentiostat, following steps must be performed:

1- Connect the OrigaBox to the computer by a USB cord as on figure 2.

1



Figure 2: Connection of OrigaBox to PC

2- Connect the RDE to the OrigaBox and the OrigaFlex through related cords as on figure 3.

3- Then connect the OrigaSwitch to the OrigaBox "COM" plug.

3



2



Figure 3: Connection of OrigaTrod, OrigaBox and OrigaSwitch.



Software Setup for OrigaFlex

To allow the control of the OrigaBox by the OrigaSwitch, follow the below steps in the OrigaBox Interface software:

A) Power up the OrigaBox and run the OrigaBox Interface software as figure 4. Then by clicking on OrigaBox, the instrument is recognized. The "Start" button back-color must be green.

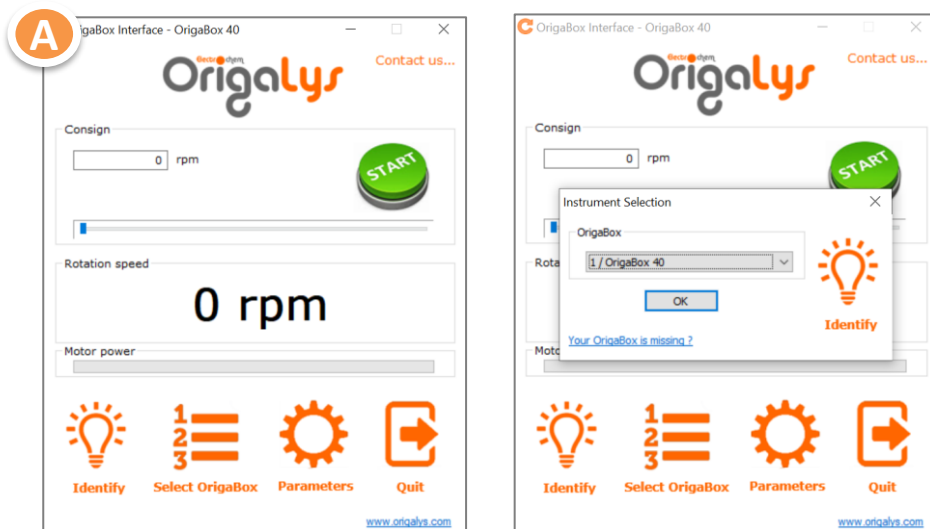


Figure 4: Software recognition of OrigaBox

B) Once the connection is established, click on "Parameters" icon in order to display the "OrigaBox - Parameters" configuration window.

C) Set the options of the "Com plug" tab as figure 5.



Software Setup for OrigaFlex

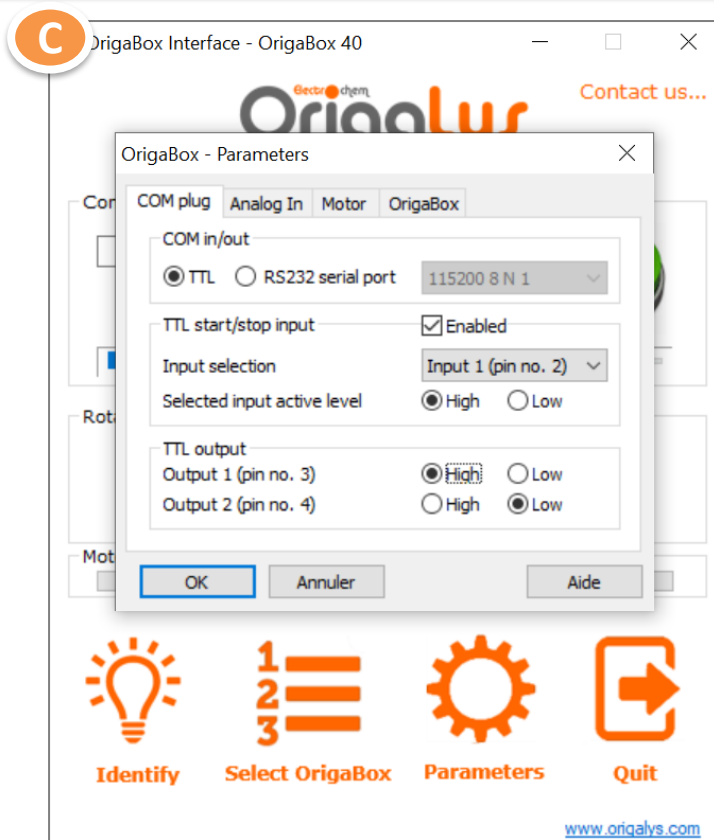


Figure 5: Parameters for controlling OrigaSwitch

Now OrigaBox is ready to be controlled by pressing on the OrigaSwitch pedal to stop or start the OrigaTrod RDE electrode rotation.

NOTE: While OrigaSwitch is under control, the electrochemical test is running in parallel on OrigaMaster or OrigaViewer software.



Hardware Setup for OrigaStat

Connecting the OrigaSwitch to OrigaStat is easier thanks to its built-in RDE speed controller. Establish the connections as below:

Connect the RDE to OrigaStat and the Switch to the "COM2" socket on the rear panel of OrigaStat (figure 6).



Figure 6: Connection of OrigaTrod and OrigaSwitch to OrigaStat

NOTE: The OrigaSwitch is compatible with OrigaStat OGS100 and OrigaStat OGS200.

Software Setup for OrigaStat

For controlling the Switch with OrigaMaster software, figure 7 shows an example of flowchart. "Input/Output" box is for controlling the Switch. By "Calculation" and "Condition" it is possible to define a loop and repeat the test (please look OrigaMaster help file).

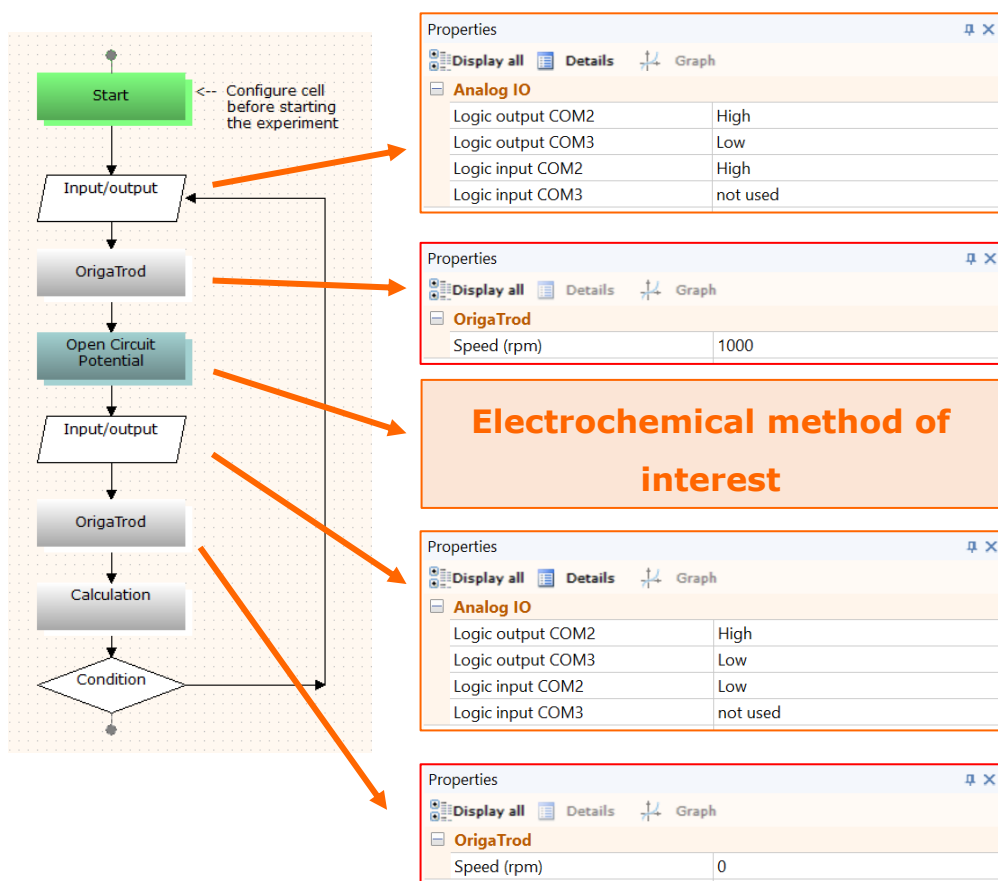


Figure 7: How to set OrigaSwitch function into OrigaMaster



Chrono amperometry test with OrigaStat

In this part the example of using OrigaSwitch is explained.

The method in use was chrono amperometry on the rotating disk electrode surface in Ferri-Ferro cyanide solution. The related flowchart is shown in figure 8. The "Input/Output" parameters were defined as figure 7.

Both chrono amperometries were run 10 times, each of it at 2000 rpm and 0 rpm (stopped rotation) alternatively.

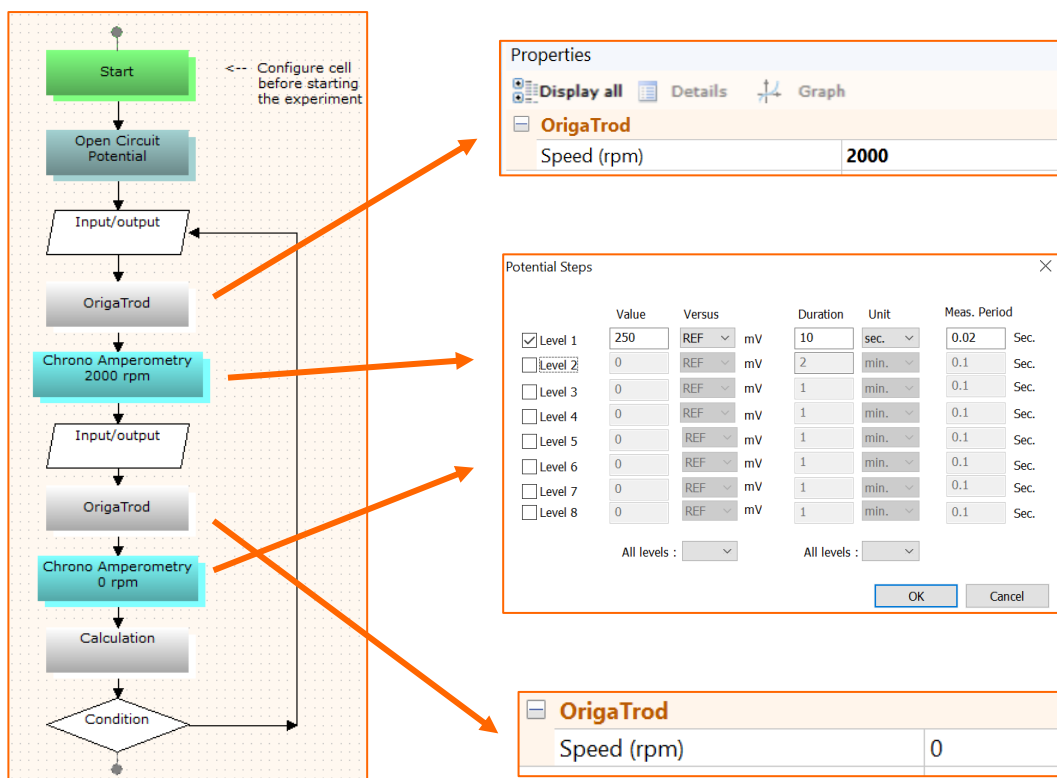


Figure 8: Flowchart related to performing CA with OrigaSwitch



Chrono amperometry test with OrigaStat

At the beginning of the test, the following message will appear, corresponding to the expected high logical level on "COM2" plug. As soon as the user will press OrigaSwitch, the RDE will rotate at the higher specified speed (here is 2000 rpm) and then the measurement sequence will be run (figure 9).

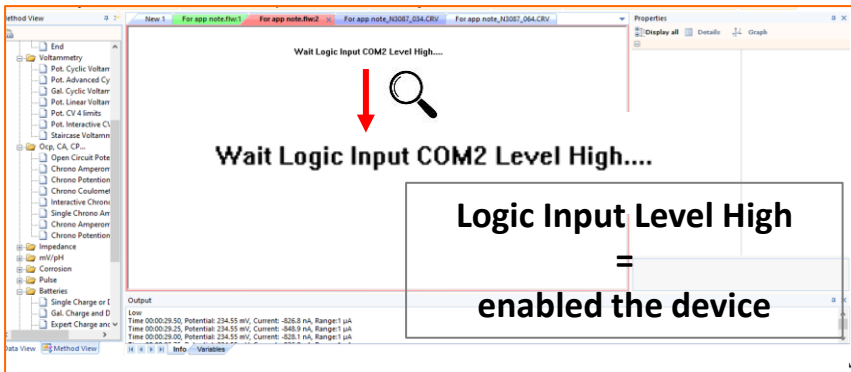


Figure 9: After showing this message, pressing the OrigaSwitch will start the first CA test.

After the first chrono amperometry finishes, the other message will appear regarding the low logical level expected on "COM2" plug. Pressing once again on the OrigaSwitch will stop the RDE rotation and run the second CA experiment (figure 10).

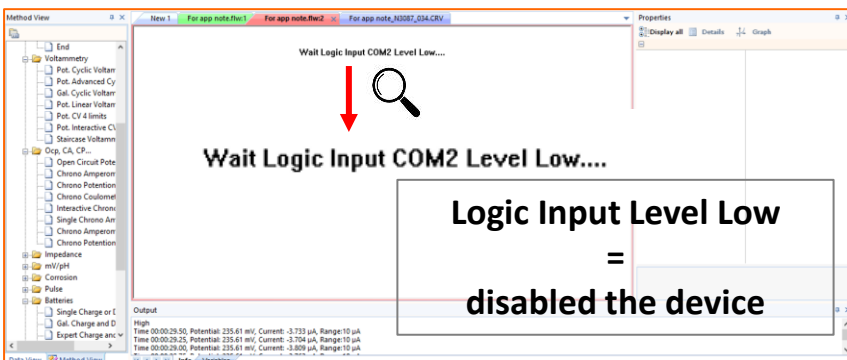


Figure 10: After showing this message, pressing the OrigaSwitch will start the second CA test.



Results and Discussion

Figure 11 shows the chrono amperogrammes of ferri/ferro cyanide solution in 2000 rpm and 0 rpm. In the 2000 rpm rotation speed the capacitive current is lower, and the reaction get to equilibrium faster than 0 rpm.

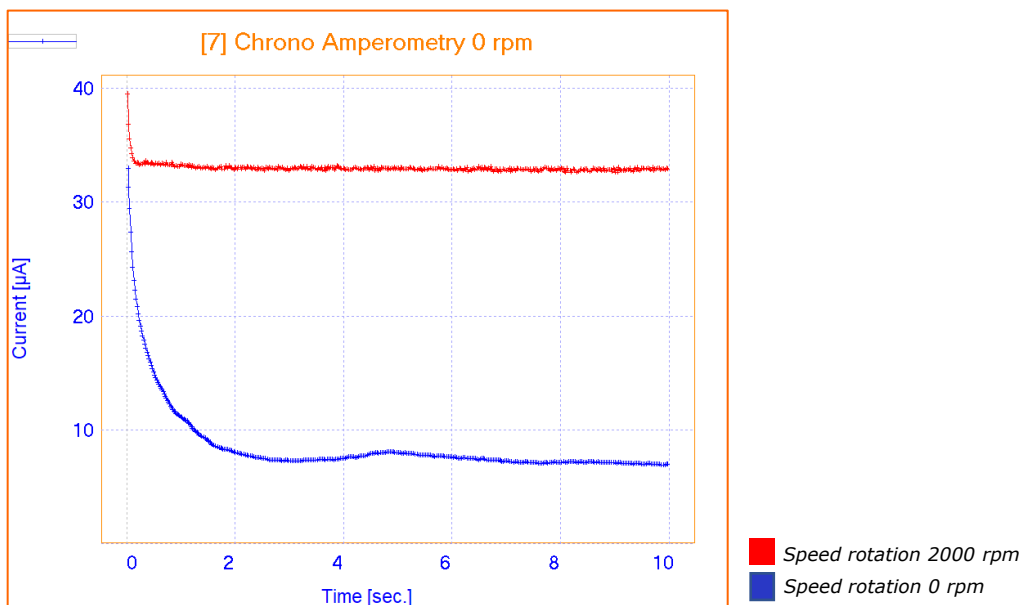


Figure 11: Chrono amperometry curves of ferri/ferro cyanide

INSTRUMENT AND ELECTRODES



Figure 12: OrigaStat OGS100 and OrigaFlex OGF500

Electrode setup

Reference Electrode (REF)	Calomel Type: OGR003
Counter Electrode (AUX)	Platinum wire \varnothing 1mm Type: OGV005
Working Electrode (WRK)	Pt tip \varnothing 2mm EMOGTPTD2CIAL
Electrolyte	KCl 10 gr/L
Sample	Ferri/Ferro Cyanide 0.01 M
Instrument	OrigaStat OGS100 / OrigaFlex OGF500
Software	OrigaMaster 2.5.0.0



Figure 13: OrigaBox



Figure 14: OrigaSwitch

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