Multiplexer, Polypotentiostat or Multichannel instrument?

Introduction

PalmSens offers you different ways of performing your experiment with as little time investment as possible, e.g. measuring more than one sample at the same time is an easy way to save time. Here you will find a brief explanation what the different possibilities for measuring more than one sample at a time are. This will help you to choose the ideal PalmSens instrument to support your application.

Multiplexer

The **MUX8-R2**, **MUX8, MUX16, EmStatMUX8 and EmStatMUX16** are multiplexer instruments. While the first two ones are extensions for a PalmSens or an EmStat the latter ones are EmStats with an integrated multiplexer. The MUX8-R2 is the successor of the MUX8 and MUX16. The MUX8-R2 has a maximum of 8 cells, but the MUX8-R2 can be combined with another MUX8-R2 to create 16 cells. Actually, you can combine MUX8-R2s to up to 128 cells.

A multiplexer is like a multi way valve. One potentiostat is connected to this valve and the valve (the multiplexer) switches the connection of the potentiostat between the different channels. For most methods the switching is done after the experiment is finished (e.g. DPV, CV), but for time depending methods like chronoamperometry (amperometric detection) or (open circuit) potentiometry the channel can be switched between each point of the measurement within 25 milliseconds. So virtually the measurement is done parallel. It doesn't matter if the electrode systems are in separated cells or share one solution, since only one set of reference electrode (RE), counter electrode (CE) and working electrode (WE) is active at a time.

So keep in mind: A multiplexer is an economic solution to increase the efficiency of your sample throughput, but it never measures different electrodes at the exact same point in time.

Polypotentiostat

The **EmStat 4WE** and a **PalmSens with BiPot** module are polypotentiostats. A polypotentiostat is a single potentiostat with multiple WEs, but just one RE and one CE. Since it is one potentiostat all electrodes need to be in the same cell. The working electrodes will all be measured parallel, so you could perform 4 CVs absolutely synchronized at 4 different working electrodes in the same solution. Since the electrodes belong all to the same potentiostat they depend on each other. As a consequence the WE number 1 determines what the other WEs should do. You can apply to the other working electrodes either a constant potential or the electrodes follow the WE number 1 but you can choose a potential offset. For example your WE1 could do a CV and the other WEs do the same CV but number 2 with 200 mV of an anodic shift, number 3 400 mV and number 4 600 mV. So keep in mind: A polypotentiostat is a good instrument to measure a lot of electrodes in the same solution at exactly the same time, for example to perform electrochemical polishing with gold electrodes. But however the experiments are not independent and need to be in the same cell and the WEs need to perform the same method or have a constant potential.

Multichannel instrument

The **MultiEmstat** series are multichannel instruments. Basically these instruments are just independent potentiostats in one shell. This is a highly compact system and needs way less space than the potentiostats in their own private shell. All the potentiostat just need a single USB connection and can be controlled by one program (Multitrace). Theoretically each independent potentiostat need to be connected to an electrically independent cell, i.e. the electrodes should not be in the same solution. However, some conditions allow the use of more than one three electrode system in a solution. This should for example be the case if the resistance between the three electrodes of one system is negligible compared to the resistance between the different 3-electrode systems.

So keep in mind: A multichannel instrument offers independent potentiostats that can be used at the same time or different points in time performing experiments that don't depend on each other. The cells should be independent from each other. It is highly suitable for labs that want to have a high density of experiments per lab space.

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Compact Electrochemical Interfaces