



Multiplexer, polypotentiostat or multi-channel?

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. 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.

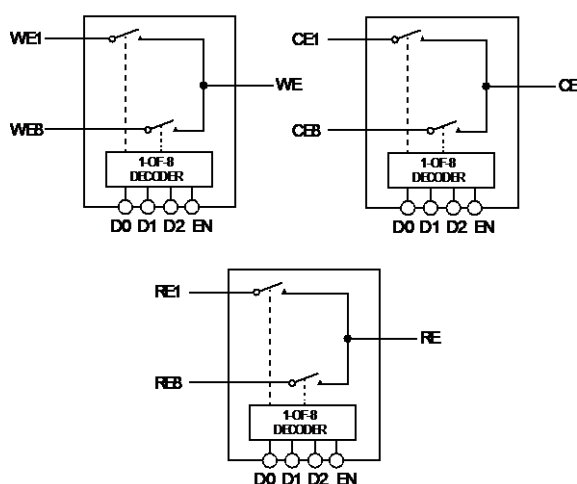


Figure 1 - Functional diagram of an 8-channel multiplexer

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.

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

A PalmSens with BiPot module is polypotentiostat. 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 four CVs absolutely synchronized at four 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 one 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 one 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 two with 200 mV of an anodic shift, number three 400 mV and number four 600 mV.

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.

The MultiPalmSens4 can also be used as a polypotentiostat by synchronizing multiple channels.

For more information, continue reading [our application note about using multi-channel instruments as polypotentiostats](#).

Multi-channel instrument

The MultiEmstat series and the MultiPalmSens4 are multi-channel instruments. Basically these instruments are multiple independent potentiostats in one shell. This is a highly compact system and requires way less benchspace than having individual potentiostats each in their own 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 or the multi-channel device has individual galvanic isolation for each channel.

A multi-channel instrument offers independent potentiostats that can be used at the same time or at different points in time. The experiments on different channels can either be independent or synchronized on multiple channels.

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.

For more information, continue reading [our application note about using multi-channel instruments as polypotentiostats](#).

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