CYCLIC VOLTAMETRY

FYTRONIX-9000

System includes

Specifications

Potential range ±20 V

Potential compliance   ±20 V

Applied potential accuracy   ±1 Mv

Applied potential resolution   100 μV

Maximum current   250 mA

Current measurement accuracy ±10 nA offset

Communication

Techniques

EIS vs Frequency (IMP)

EIS vs Potential (IMPE)(Mott-Schottky)

EIS frequency range: 125 μHz~25 MHz

Electrochemical Impedance Spectroscopy

Potentiostatic Impedance Spectroscopy

Potentiostatic EIS Repeating

Galvanostatic Impedance Spectroscopy

Impedance Spectroscopy

Single Frequency Impedance Spectroscopy

Mott-Schottky

Impedance Spectroscopy

Physical Electrochemistry

Cyclic Voltammetry

Linear Sweep Voltammetry

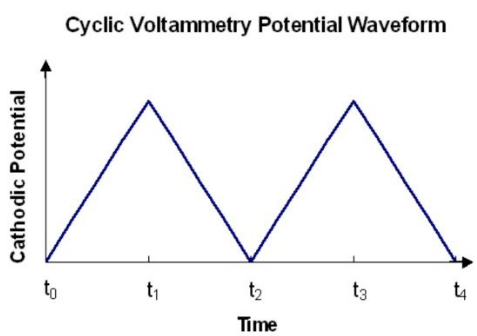
Staircase voltammetry

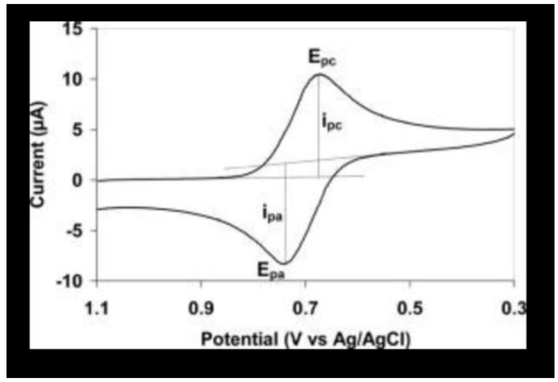
SOFTWARE

System include
Cyclic voltammetry
EIS analyzer
Software
Connections cable

,

Cyclic Voltammetry (CV) is an electrochemical technique which measures the current that develops in an electrochemical cell under conditions where voltage is in excess of that predicted by the Nernst equation. CV is performed by cycling the potential of a working electrode, and measuring the resulting current





Bode and Nyquist Plot

In this chapter the two main ways of visualizing Electrochemical Impedance Spectra (EIS), the Nyquist and Bode plot, are presented and it is explained how different EIS of easy electronic circuits will be plotted in the Bode and Nyquist plot. This demonstrates the advantages and disadvantages of the two plots as well as serving as a foundation to understand the analysis of EIS by utilizing equivalent circuits.

As mentioned in the previous chapter there are two main ways to plot an impedance spectrum. One is the Bode plot. This plot is actually two plots in one. The abscissa is a logarithmic scale of the frequency and one ordinate is the logarithm of the impedance Z while the second ordinate is the phase shift Φ.

The advantage of this plot is that all information is clearly visible. A capacitor in parallel to a resistor, which is an important circuit for electrochemical impedance spectroscopy, is visible in this spectrum as a peak in the phase shift. Single components can be easier understood in the Bode plot.

The Nyquist plot is more complex to understand, but due to practical reasons is more popular in electrochemistry. One reason is that the Nyquist plot is very sensitive to changes. Another is that for the most common circuits some parameter can be read directly from the plot. To get a Nyquist plot the negative imaginary impedance –Z'' is plotted versus the real part of the impedance Z'.

In the following paragraphs some simple components effects on a Bode plot and Nyquist plot will be shown. This is useful, because it is common to create an electronic circuit that represents the electrochemical system under investigation

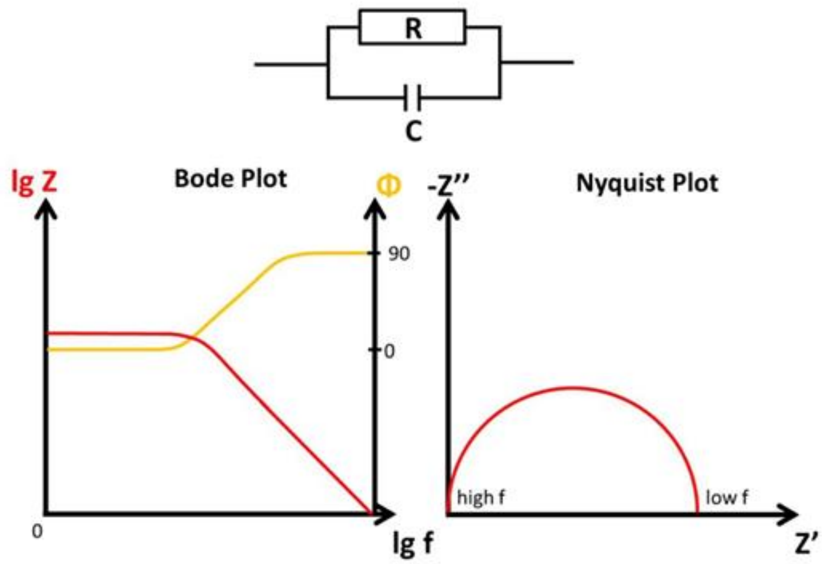


Fig.4 Nyquist and Bode Plots of material