

eQCM 10M™

Electrochemical Quartz Crystal Microbalance



GAMRY
INSTRUMENTS

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Gamry's eQCM 10M is a rapid, impedance-scanning quartz crystal microbalance (QCM) system. Any crystal in the frequency range of 1-10 MHz can be used. The eQCM 10M can be used as a stand-alone instrument or in combination with a potentiostat.



Features

- Frequency Resolution of 0.02 Hz
- Impedance Scanning Gives the Full Crystal Spectrum
- No Need to Manually Compensate for Parasitic Capacitance
- USB interface
- Integrated QCM and Potentiostat Data Acquisition
- Data Analysis in Gamry's Flexible and Customizable Echem Analyst™
- Includes Cell and Five Crystals

Applications

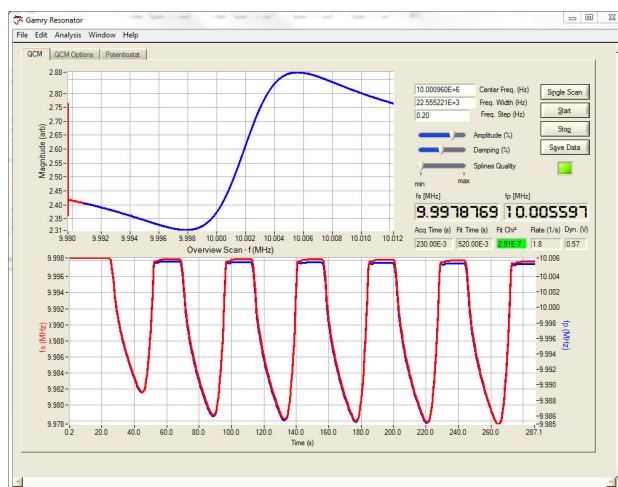
- Polymer Adsorption/Desorption
- Electroactive Polymers
- Li^+ Intercalation
- Ion and Solvent Transport
- Corrosion Studies
- Plating Studies
- Underpotential Deposition
- Antibody-Antigen Interactions
- Surfactant Adsorption
- Self-Assembled Monolayers
- Nanoparticle Adsorption
- Surface Coatings

Fast Data Acquisition and Fitting

Very high data acquisition rates make the eQCM 10M an economical choice compared to more expensive network analyzers.

For example, you can acquire a 20 kHz spectrum at 0.2 Hz resolution in as little as 20 ms. Unlike some other QCMs it does not rely upon a phase lock oscillator, so it does not require the manual cancellation of parasitic capacitance.

The crystal's frequency spectrum is modeled using a linear fit of a rational function - a Padé approximant - providing the series resonance frequency and parallel resonance frequency, f_s and f_p , respectively. With these two parameters you gain information about the viscoelastic properties of the film in addition to mass changes. Not only can you get mass information from either of these two parameters but we also use these two terms to calculate a reduced quality factor, Q_r , which gives a good indication that your film is changing from a rigid film to a viscous film.



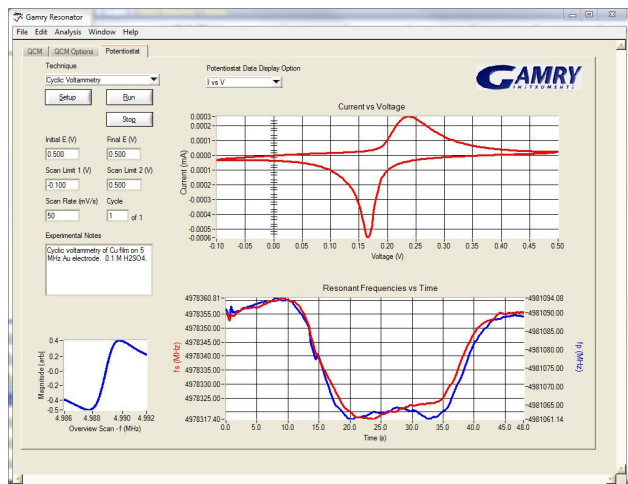
Data acquisition is controlled with one program. QCM control is on one tab while potentiostat control is on another tab.

Software

Gamry's Resonator™ software controls both the QCM and a Gamry Instruments potentiostat. Resonator comes with a full suite of physical electrochemistry techniques.

Electrochemical Techniques

- Cyclic Voltammetry
- Linear Sweep Voltammetry
- Chronoamperometry
- Chronopotentiometry
- Chronocoulometry
- Controlled Potential Coulometry
- Repeating Chronoamperometry
- Repeating Chronopotentiometry
- Multiple-Step Chronoamperometry

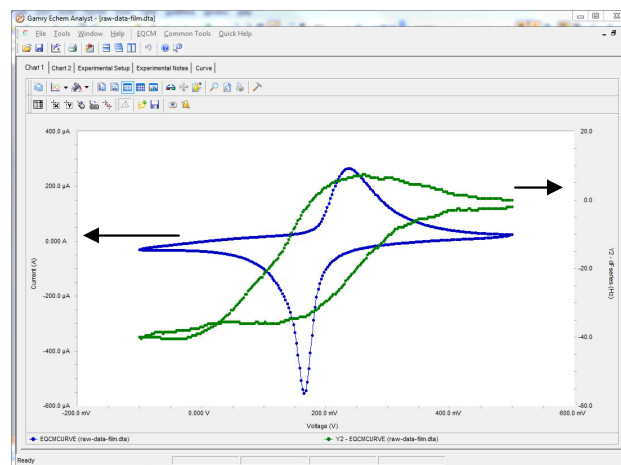


Frequency data are also displayed on the potentiostat tab during acquisition. Here are both the QCM and potentiostat responses during the cycling of a Cu film on an Au electrode.

Data Analysis with Gamry's Echem Analyst™

When you combine the eQCM IOM with a Gamry Potentiostat such as a Reference 600™, you get the

combination of state-of-the-art instruments. Data is easily incorporated into Gamry's powerful Echem Analyst giving an intuitive feel to analysis and presentation. Current/Voltage curves overlaid with frequency data are standard. Other plotting formats such as Δm versus Charge (Coulombs or moles) or Q_r versus time are available with the Curve Selector. Linear fitting of Δm versus Charge returns the molar mass of a mobile species into or out of a film.



In Echem Analyst, Current/Voltage data are overlaid with frequency data as part of the standard data analysis. We give you flexibility to arrange charts in any number of ways.

Additionally, Echem Analyst scripts are written using Visual Basic® for Applications, giving you the ability to modify data handling. For example, if you wanted to calculate solvent flux in a polymer film during redox cycling, you could write a custom script to calculate and display flux versus potential, time, or charge.

Resonator even has the ability to record the crystal's entire relative impedance spectrum, into a database, at each individual data point (or every n^{th} point). This exciting feature lets you investigate phenomena in more detail after an experiment has concluded. Spectra can be opened in Echem Analyst or any other plotting or analysis program (e.g. Mathcad or Matlab) for modeling purposes.

Stand-Alone Use

The eQCM IOM system can also be used as a stand-alone instrument. If you are interested in mass changes from processes such as formation of self-assembled monolayers, cell adsorption, or protein binding events, you will find the eQCM IOM a convenient choice. Data analysis can again be accomplished in our powerful and flexible Echem Analyst.

Corrosion engineers interested in mass changes will also find the instrument particularly useful since the frequency changes can be directly correlated to gain or loss of material. You could even customize the data analysis script to automatically calculate a corrosion rate based on mass loss versus time.

System Information

The eQCM IOM is shipped with the Gamry Resonator Software, Gamry Echem Analyst Software, a Quick Start Guide, a Hardware Operator's Manual (CD), a Software Operator's Manual (CD), one eQCM cell, one AC Power Adapter, one USB interface cable, one BNC cable, one potentiostat interface cable, and 5 Au-coated quartz crystals (5 MHz).

The eQCM IOM is protected by a two-year factory service warranty.

The eQCM IOM must be interfaced to a computer with a Gamry Potentiostat (models include the Reference 3000™, Reference 600™, Series G 750™, Series G 300™) and a PHE200™ license for incorporation and combination of QCM and potentiostat data into Echem Analyst. Microsoft® Windows XP, Windows Vista®, or 7 is required.

Available Accessories

- eQCM Cell
- 5 MHz 1.37 cm Diameter AT-cut Au-Coated Crystals
- 5 MHz 1.37 cm Diameter AT-cut Carbon-Coated Crystals

Specifications

SYSTEM	
Frequency Range	1 - 10 MHz
Frequency Resolution	0.02 Hz
Interface	USB
Operating Temperature Range	0 to 45 °C
Relative Humidity	Max 90% Non-condensing
Storage and Shipping Temperature	-25 to 75 °C
WEIGHT	1 kg
DIMENSIONS	175 x 115 x 80 mm
AC Power Adapter	100-264 V AC, 47-63 Hz
Quartz Crystal Microbalance	12V DC, 25 W

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Instruments

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