System Information

Gamry's eQCM 10M is a rapid, impedance-scanning quartz crystal microbalance (QCM) system designed for operation in a liquid environment. Any crystal in the frequency range of 1-10 MHz can be used. This is ideal for those who develop their own cells or integrate their cell into other systems such as spectrometers, AFMs, or SECMs.

Instrument Features

- No Need to Manually Compensate for Parasitic Capacitance
- USB Interface
- Integrated QCM and Potentiostat Data Acquisition when coupled with a Gamry Potentiostat
- Data Analysis in Gamry's Flexible and Customizable Echem Analyst™
- Includes cell and five crystals

The eQCM 10M 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, one grounding cable, and five Au-coated quartz crystals (5 MHz).

The eQCM 10M is protected by a two-year, factory-service warranty.

The eQCM 10M must be interfaced to a computer with a Gamry potentiostat* for incorporation and combination of QCM and potentiostat data in Echem Analyst.

**models include the Interface and Reference families of instruments.*

Available Accessories

- Temperature-controllable QCM Cell (one included with unit)
- Flow module for QCM Cell
- 5 MHz AT-cut Au-coated crystals (five included with unit)
- 5 MHz AT-cut Carbon-coated crystals
- 5 MHz AT-cut Fe-coated crystals
- 5 MHz AT-cut Pt-coated crystals
- Other metals may be available upon request

SPECIFICATIONS

SYSTEM	
Frequency Range	1 - 10 MHz
Frequency Resolution	0.02 Hz
Interface	USB
Operating Temperature Range	0 to 45 ºC
Relative Humidity	Max 90% Non-condensing
Storage and Shipping Temperature	-25 to 75 ºC
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

GAMRY INSTRUMENTS

Gamry Instruments designs and manufactures a variety of electrochemical instrumentation and accessories that are designed to fit your needs and budget. We are, first and foremost, electrochemists and materials scientists who love creating quality instrumentation and enjoy seeing it used creatively.

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eQCM 10M

Electrochemical Quartz Crystal Microbalance

GAMRY INSTRUMENTS

Electrochemical Quartz Crystal Microbalance

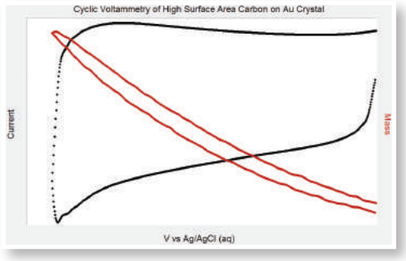
The electrochemical quartz crystal microbalance (EQCM) can be used to study a variety of interfacial phenomena. These phenomena can include:

- Li^+ Intercalation
- Electrodeposition
- Corrosion Studies
- Electropolymerization
- Ion/Solvent Adsorption and Transport
- Binding Events

All of these processes result in mass changes to the surface being studied. The eQCM utilizes quartz crystals that resonate at specific frequencies upon the application of an AC signal. These resonant frequencies will change as mass is lost or added to the electrode on the face of the quartz crystal.The eQCM 10M monitors these frequency changes in order to calculate mass gained or lost.

APPLICATIONS

Energy Research

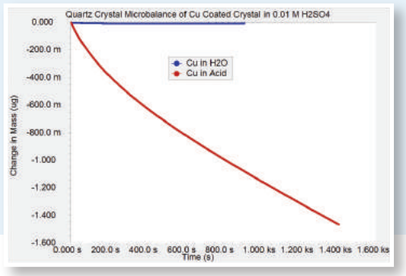


Understanding ion intercalation is an important part of battery development. Assemble your half-cell on a coated crystal and monitor mass changes as your cycle the potential – giving you insight into various charge transfer steps. Repeated cycling can allow you to understand trapping mechanisms and how they shorten device lifetime.

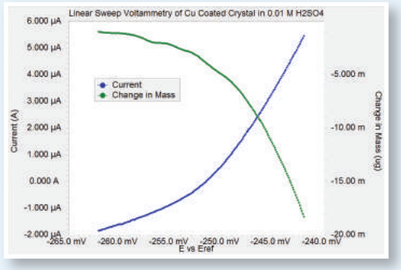
Studying ion fluxes is an important step in improving the performance of supercapacitors. Ions and solvent will adsorb and desorb when the potential of the electrode is cycled. Understanding the relationship between mass and charge allows you to identify key ions in your electrode processes. Knowing what ions are moving then allows you to understand solvent behavior during your experiment.

Corrosion Studies

Measuring corrosion rates by mass loss is easy with the eQCM 10M. Below is an example of Cu corroding in an acidic solution.



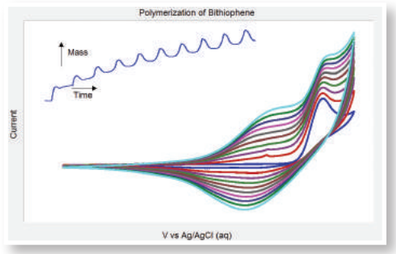
Inhibitors could be studied too – see how the mass loss rate decreases after you add an inhibitor. Or you can actively polarize your electrode using a potentiostat to induce corrosion.



Physical Electrochemistry

Electropolymerization and electrodeposition are two important processes in physical electrochemistry. Both produce mass changes to the electrode surface in the form of a film. Mass-charge relationships during deposition provide insight on deposition processes while mass-charge relationships of already-formed films provide insight into film redox properties.

Repeated cycling of an Au-coated quartz crystal in the presence of bithiophene results in increases in current and mass.



Sensor Development

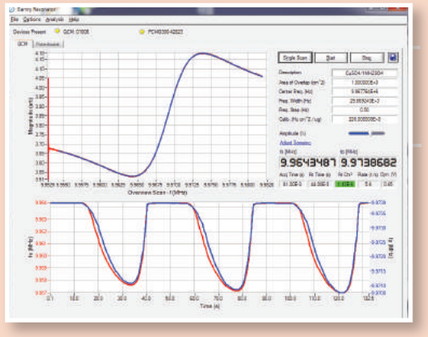
Sensors rely upon binding events to produce a change. Mass changes are easily detected when an analyte binds to a functionalized electrode. No more labeling the species of interest for spectroscopic detection – the QCM can respond to any binding event.

Software Features

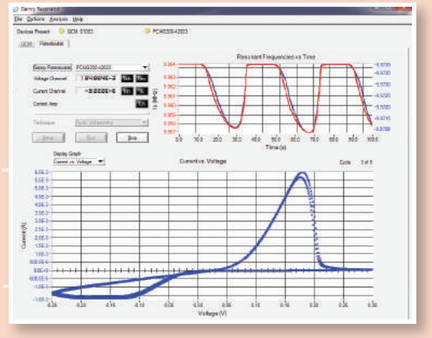
Gamry's Resonator™ software controls both the QCM and a Gamry Potentiostat. Resonator includes a full suite of physical electrochemistry techniques.

Electrochemical Techniques

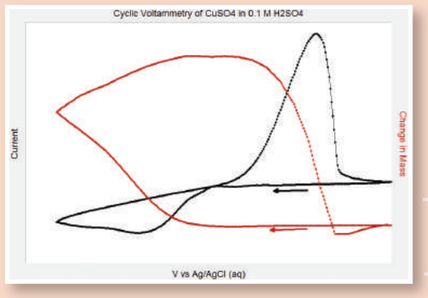
- Cyclic Voltammetry
- Linear Sweep Voltammetry
- Chronoamperometry
- Chronopotentiometry
- Chronocoulometry
- Controlled Potential Coulometry (Bulk Electrolysis)
- Repeating Chronoamperometry
- Repeating Chronopotentiometry



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



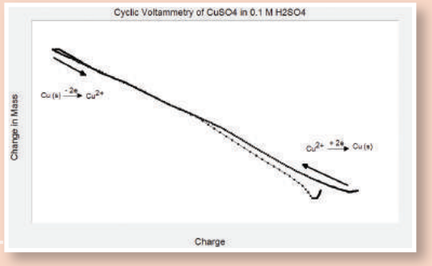
Frequency data is displayed on the potentiostat tab during acquisition. Here are both the QCM and potentiostat responses during the cycling of a Cu film on an Au electrode.



When you combine the eQCM 10M with a Gamry Potentiostat such as a Reference 600+™, you get the combination of state-of-the-art instruments. Data are 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.

In Echem Analyst, Current/Voltage data are overlaid with frequency data as part of the standard data analysis.

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.



Easily plot Mass versus Charge to back out Molar Masses.