LEWVAC
Quality Components For Vacuum Technology

High Temperature Monitor Crystals

Superior Crystals for Harsh Process Film Thickness Monitoring

The measurement of film thickness during a vacuum deposition process can be accomplished with great accuracy and precision using a quartz crystal microbalance, or QCM. Under controlled conditions, it is possible to achieve Angstrom level resolution of the film thickness. In practice, however, this is rarely achieved.

A film thickness monitor measures the change in resonance frequency of an oscillating quartz crystal while a thin film coating is collecting on its surface. As the coating builds up the resonance frequency decreases in a very predictable fashion. If the density of the deposited film is known, the thickness of the film can be calculated in real-time.

A film thickness monitor, however, works on the underlying assumption that any change in the resonance frequency is solely a result of film build-up. Unfortunately, quartz crystals can also change resonance frequency when exposed to a thermal gradient or mechanical stress. In a typical thin film deposition, both of these phenomena exist due to either the deposition source radiation, highly energetic species (as in sputtering) or stresses caused by film condensation. Often these factors exist in concert.

For processes that operate at temperatures above 100°C, standard quartz crystals are extremely noisy. This noise prevents accurate and stable film thickness measurements. For this reason, two types of monitor crystals were invented that operate stably above 100°C, are stress insensitive, and can operate in plasmas--the RC™ quartz crystal, good to 300°C, and SuperQuartz™ **(SQ™)**, a revolutionary crystalline material good to 500°C+. Both crystals now enable measurement of ALD, CVD, OVPD, high temperature PVD and thin film furnace processes such as selenization and indiffusion.

As an added benefit, the RC™ crystal will not show a rate spike when the deposition source shutter is opened, or exposed to plasmas. Typically, this action causes a frequency shift of up to 100 Hz, which translates to rate changes of 50 Angstroms or more for films such as aluminum. Further, the noise associated with the intense energy of impinging atoms in sputtering is dramatically reduced, owing to the stress insensitivity of the crystal. These are very real advantages in the measurement of nanometer films used in the manufacture of OLED's, precision optical interference films, or next generation electronic devices (including solar cells).

RC™ and SQ™ crystals can be used in place of standard AT-cut quartz in all commercially available film thickness monitors and controllers. They are available in 5 or 6 MHz versions, with gold, aluminum, or platinum (SQ™ only) electrodes, sized in 14mm (RC™ & SQ™) and 12.5mm (RC™ only) diameters.

14mm 6MHz RC™ Crystals

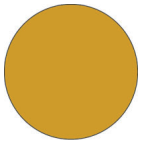
Gold
Aluminum

Frequency: 5.975-5.993 MHz
Resistance: < 40 Ohm
Finish: 7 microns RMS
Diameter: 14mm
Contour: Plano-Convex
Cut: RC cut +/-1'

14mm 5MHz RC™ Crystals

Gold
Aluminum

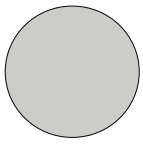
Frequency: 4.960-4.975 MHz
Resistance: < 40 Ohm
Finish: 7 microns RMS
Diameter: 14mm
Contour: Plano-Convex
Cut: RC cut +/-1'



12.5mm 5MHz RC™ Crystals

Gold
Aluminum

Frequency: 4.990-5.000 MHz
Resistance: < 40 Ohm
Finish: 7 microns RMS
Diameter: 12.5mm
Contour: Plano-Convex
Cut: RC cut +/-1'



14mm 6MHz SQ™ Crystals

Gold - Part code - TF-CRY
Aluminum
Platinum

Frequency: 5.975-5.993 MHz
Resistance: < 40 Ohm
Finish: 7 microns RMS
Diameter: 14mm
Contour: Plano-Convex

RC™ crystals packaged 10 pieces per disk
SQ™ crystals packaged 5 pieces per disk