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Research Article

Analyzing Spur-Distorted Impedance Spectra for the QCM

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Abstract

The quartz crystal microbalance (QCM) is a sensitive device for determining the properties of materials loading it. One of the fundamental means of making these measurements is the so-called impedance (or admittance) spectra method. The resonant properties of the piezoelectric QCM sensor are measured over a spectral range in the neighborhood of a resonance, both with load and without load. The changes in the spectrum upon loading can be compared to models that describe the changes based on the mass density, the shear modulus, and the viscosity of the load. This comparison can be made with confidence so long as the spectrum corresponds to the model assumption of a single main resonance. Often, there exists a spurious resonance lying above the main resonance which is not included in the models. This can change the shape of the spectrum in ways not included in the model analysis. We describe a method we have used that separates the spur resonance from the main resonance, permitting the parameters of the main resonance to be isolated from that of the spur. These corrected parameters of the main resonance can then be used with confidence in model analyses.

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