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Microcantilever Gas Analyzer for Detecting Resonances (05-015, 09-039)

Simple and Portable Resonant Frequency Detector

Market Overview

This resonance frequency detector is capable of detecting a wide variety of parameters affecting resonance through the use of a patented micro-cantilever. This detector modulates electric charge at varying frequencies on a counter electrode until it matches the induced frequency on a cantilever. Current resonance detection devices require piezoelectric or chemically functioned cantilevers or lasers. However these methods require multiple components, are bulky, or have parasitic capacitance. Clemson University researchers have developed a method to detect chemical/biological species and measure parameters such as pressure and acceleration, magnetic force, temperature, and extremely small balances by observing the resonance changes between the cantilever and an electrode. This approach provides an electrical alternative with a simple handheld design, allowing for portability and addressing unmet needs of the market.

Application

Detection of chemical/biological species

Stage of Development

Working Prototype

Advantages

- Lower cost, operates without lasers or special cantilevers used in current systems
- Easy manipulation of resonance, creating a wide range of measurement possibilities
- Simple recognition of micro/nano-sized chemical/biological species, allowing for portable detection in hand-held form

Technical Summary

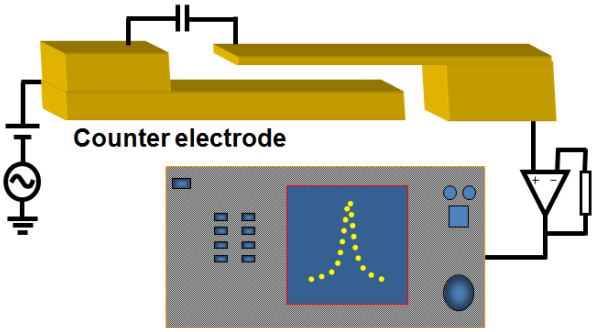

Figure 1: An example of the invention setup and output display

This detector identifies and analyzes electrical signal in semi-conductive or conductive elements at resonance frequencies. The detection and analysis of an electric signal is performed based on movement between an element and a counter electrode influenced by a non-linear electric field produced by an electrical signal impressed between the element and counter electrode. Changes in the distance and environmental parameters between the element and counter electrode. Changes in the distance and environmental parameters between the element and the counter electrode may be monitored based on the changes in the value of the capacitance between the element and counter electrode. The method includes applying a signal to a counter electrode and thereby inducing an electrostatic force on a cantilever that is in a non-contact arrangement with electrode. This electrostatic force generates electric signal at the element. At resonance, this generated signal will contain not only the fundamental mode of the applied signal, but will also contain harmonics of the generated signal. By observing the changes in the generated signal, chemical/biological species can be detected as well as monitor parameters that influence resonance.

For More Information Contact: Andy Bluvas | bluvasa@clemson.edu | (864) 656-5157 | CURF Reference No. 05-015, 09-039

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App Type	Country	Serial No.	Patent No.	CURF Ref. Number	Inventors
Utility	United States	12/573,433	8,384,372 7,598,723	2005-015 2009-039	Apparao Rao, Malcom Skove, Doyl Dickel, Gayatri Kesar, Bevan Elliot, Herbert Behlow Jr

About the Inventor

Dr. Apparao Rao is the current Robert A. Bowen Professor of Physics at Clemson University. He received his Ph.D. in condensed Matter Physics from the University of Kentucky. Prior to joining Clemson he held a Post-doctoral Research Associate position at the MIT and was an Assistant Research Professor at the University of Kentucky. He is the founder of the Clemson Nanomaterials Center and has received the South Carolina Governor's Award for Outstanding Achievement in Research. His research interests include the characterization and applications of carbon nanotubes, semiconducting nanobelts, nanowires and thermoelectric materials.

For More Information

To learn more about this technology, please contact:

Andy Bluvas
Technology Commercialization Officer
bluvasa@clemson.edu
(864) 656-5157