

Hybrid Electromechanical Metamaterials for Optical and Electrical Devices

Tech ID: 29323 / UC Case 2018-497-0

ABSTRACT

Researchers at the University of California, Davis have developed a hybrid electromechanical metamaterial for use in high frequency applications for optical and electrical devices.

FULL DESCRIPTION

High frequency filters and oscillator circuits utilize mechanical resonances to absorb or emit electromagnetic energy. Currently, these types of integrated circuits use piezoelectric materials that must be micromachined and tuned to achieve a desired frequency response. Generally, the resulting frequency produced is insufficient and additional circuitry is necessary to clean up the response, taking up additional space and increasing the cost of the overall circuit.

Researchers at the University of California Davis have developed a hybrid high frequency vibrational metamaterial for use in optical and electrical devices. This superlattice metamaterial is composed of molecules and nanoparticles and can resonate in response to optical, plasmonic, electrical, thermal, or mechanical stimulation. By modifying the individual particles, a specific resonance can be achieved between 100 MHz to 2 THz. Moreover, the metamaterial exhibits a high quality factor (Q Factor), improving power efficiency and eliminating the need for costly additional circuitry.

APPLICATIONS

- ▶ Waveguides, antennas, phononic crystals, frequency separators (superprisms), and optical devices with tuned absorbance characteristics
- ▶ WiFi, GPS, Bluetooth, and other radio based connectivity
- ▶ Electrical and optical devices
- ▶ Active or passive cooling
- ▶ THz imaging
- ▶ Biosensing

FEATURES/BENEFITS

- ▶ Decreases the complexity of circuit designs by working with pure frequencies
- ▶ Tunable resonant frequencies between 100 MHz and 2 THz
- ▶ Utilizes compositional changes, not micromachined piezoelectric materials
- ▶ May reduce the cost and size of oscillator circuitry
- ▶ May result in improved power efficiency

PATENT STATUS

| Country | Type | Number | Dated | Case |
|--------------------------|---------------|------------|------------|----------|
| United States Of America | Issued Patent | 11,640,014 | 05/02/2023 | 2018-497 |

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OTHER INFORMATION

KEYWORDS

RF/mm-wave, metamaterials, phononics, photonics, high-frequency oscillator, resonator, notch filter

CATEGORIZED AS

- ▶ **Optics and Photonics**
 - ▶ All Optics and Photonics
- ▶ **Materials & Chemicals**
 - ▶ Other
- ▶ **Nanotechnology**
 - ▶ Electronics

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2018-497-0

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