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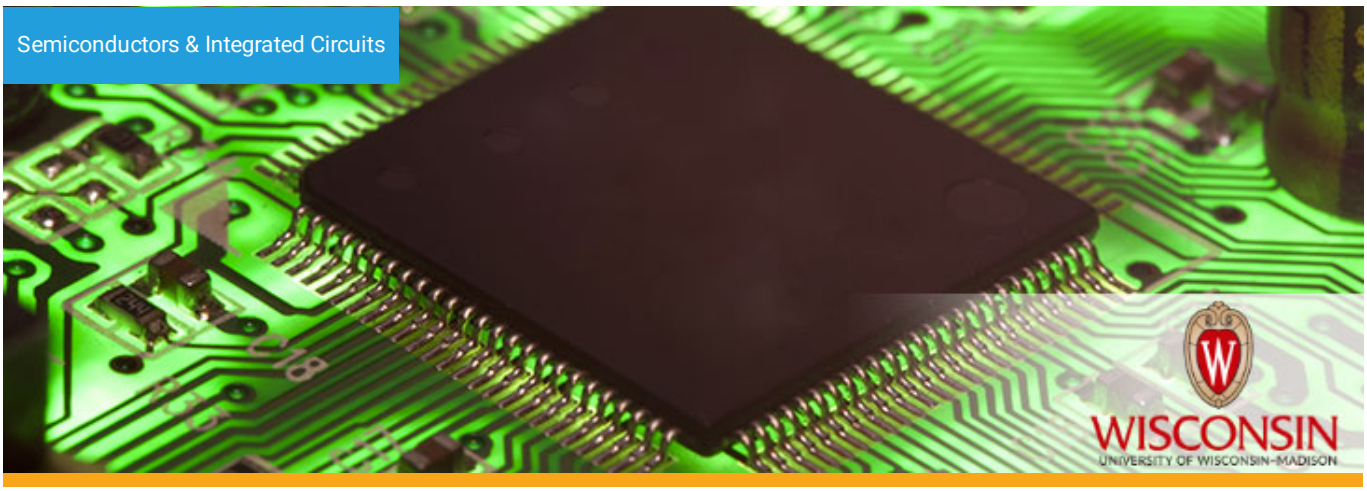

Microcavity Method for Single Molecule Spectroscopy

View U.S. Patent No. 9,535,219 in PDF format.

WARF: P140153US03

Inventors: Randall Goldsmith, Kevin Heylman

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in using an optical microcavity to analyze single molecules and particles.

Overview

Single molecule spectroscopy and microscopy – a popular tool for biological, biophysical and chemical characterization – generally requires the use of fluorescent molecules. Researchers at UW–Madison are developing a means of performing spectroscopy and microscopy on non-fluorescent single molecules, allowing a much broader range of molecules to be studied.

Their method relies on whispering gallery mode microresonators. A whispering gallery mode (WGM) is a type of electromagnetic wave that travels around a concave surface. WGM waves can propagate at the edge of a very small structure called an optical microcavity.

The Invention

Specifically, the researchers have developed a new microcavity-based method for single molecule/particle spectroscopy. In essence, when an individual molecule or particle lands on the microcavity surface, it absorbs energy from a free space pump laser beam and generates heat. The heat is transferred to the microcavity, causing a shift in resonance frequency and therefore detectable changes in the light (e.g., power or intensity).

The superb sensitivity of the method enables detection, identification and real-time analysis of single molecules and particles. This is exciting because current spectroscopy techniques are limited to matter in the 10 to 100 nanometer size range, such as nanoparticles and viruses.

Applications

- Single molecule/particle spectroscopy
- Biological and chemical sensing
- Investigating real-time reaction kinetics

Key Benefits

- Extremely sensitive
- Enables real-time analysis
- Cost-effective design

Stage of Development

The researchers have used their new method to image single nanofibers and analyze single molecules of cobalt phthalocyanine.

Additional Information

For More Information About the Inventors

- Randall Goldsmith

Related Technologies

- See WARF reference number P140153US01 for information about the researchers' method for laser tuning optical microcavities.

Publications

- Heylman K.D, Knapper K.A. and Goldsmith R.H. 2014. Photothermal Microscopy of Nonluminescent Single Particles Enabled by Optical Microresonators. Journal of Phys. Chem. Lett. 5, 1917-1923.

Tech Fields

- Analytical Instrumentation, Methods & Materials : Microscopy
- Semiconductors & Integrated Circuits : Other semiconductor technologies

For current licensing status, please contact Justin Anderson at janderson@warf.org or 608-960-9853