Photoacoustic Microcantilevers for Spectroscopy

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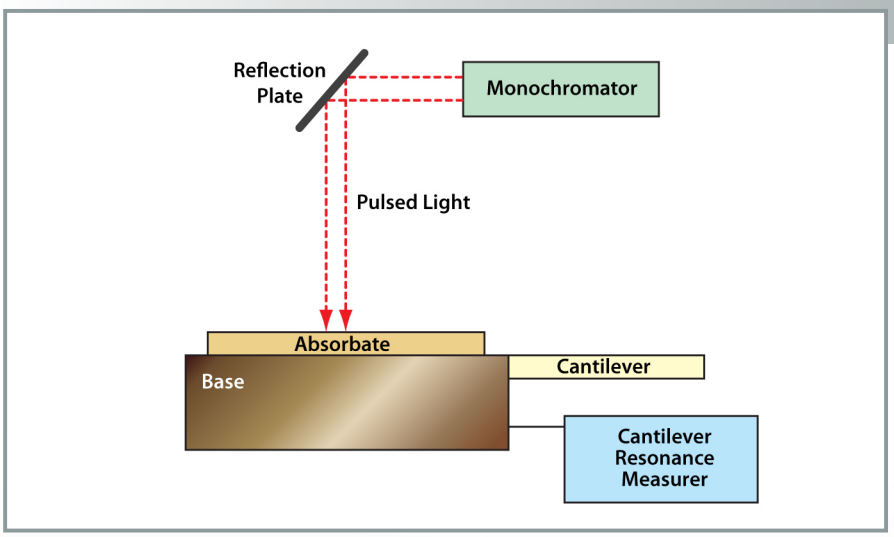

Technology Summary

ORNL researchers invented a unique microcantilever design that can identify the chemical structure of minute sample materials using photoacoustic and photothermal spectroscopy. The design advances current technology, which cannot identify specific chemicals, and furthers the detection of vapors, cells, and tissues. The technology can also characterize biomass, biomaterials, and pharmaceuticals.

In this invention, a beam of light is directed at a target substance on a base in an environment with reduced noise. The base supports a cantilever that measures the acoustic waves generated as the chopped/pulsed light is absorbed by the sample; the wavelengths of light can then be detected and measured.

As the wavelength changes, the target either absorbs or rejects each optical frequency. Rejection decreases the photoacoustic intensity, and absorption increases it; both affect the vibrating cantilever. By monitoring the variations of vibration intensity as a function of the changing wavelengths of light, researchers detect a spectrum that identifies the chemical structure of the target material.

Advantages

- Identifies chemicals in extremely small sample quantities
- Improves current technology, which cannot identify specific chemicals
- Increases the amount of chemical sample adsorbed on the sensor without losing sensitivity
- Can be made compact

Potential Applications

- Detection of chemical vapors, adsorbates, immobilized cells, and tissues
- Characterization of biomass, tissues and cells, and pharmaceuticals
- Fourier transform infrared spectroscopy to obtain an infrared spectrum of absorption, emission, photoconductivity or Raman scattering of a solid, liquid or gas

Patent

Thomas G Thundat, Charles W. Van Neste, Gilbert M. Brown, and Lawrence R. Senesac, *Photoacoustic Microcantilevers,* U.S. Patent Application 12/488,238, filed June 19, 2009.

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