



Sensors

Nanostructure Sensor of Presence & Concentration of a Target Molecule

Method and apparatus for sensing presence and estimating concentration of a target molecule, using nanotechnology.

This invention from NASA uses a nanotechnology approach that works with moving fluids (liquids and gases) to determine when a selected target molecule is present or absent in a fluid and to estimate concentration of the target molecule in the fluid. This technology can also estimate the possible presence of a second (different) target molecule in the fluid, by analyzing differences in resonant frequencies of vibration of a thin beam suspended in the fluid, after the fluid has moved across the beam. This approach allows a distinction to be made between the presence of different first and second target molecules and indicates when the target molecule has saturated the sensor. This invention also distinguishes between the presence of a given target molecule and the presence of a molecule that competes with the target molecule for attachment.

BENEFITS

- Sense presence or absence of target molecule
- Estimates concentration of target molecule
- Estimates possible presence of a second molecule in the fluid
- Distinguishes between presence of a target and competing molecule
- Indicates if the target molecule is saturated

technology solution

THE TECHNOLOGY

This technology provides a nano-structure, having known mechanical properties and having one, two, or more spaced apart beams partly coated with a selected chemical substance that binds to or has an affinity for the target molecule. The fluid is encouraged to move relative to the nano-structure and to interact with the chemical substance. In the absence of the target molecule, the micro-channel has one or more predictable resonant frequencies of longitudinal vibration. Where the target molecule becomes attached to the beam, the resonant frequency of vibration changes to another predictable value, according to one or more dispersion relations. Where two or more spaced apart beams are provided, the variation in number of target molecules attached to each of the two or more beams allows estimation of the concentration of the target molecule in the fluid. The invention allows the fluid to move relative to different sensor components to allow sensing of the presence of, and estimation of the concentration of, the target molecule. From a knowledge of the maximum concentration of the target molecule attached to the beam(s), the invention can also indicate whether the target molecule is saturated so that an estimate of the concentration in the fluid may be inaccurate.



Working at the Laboratory

APPLICATIONS

The technology has several potential applications:

- Nanotechnology
- Sensors
- Medical and Bio-medical industry
- Space exploration
- Environmental monitoring
- Analytical instruments

PUBLICATIONS

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National Aeronautics and Space Administration

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