Microcantilever Sensors

Thomas Thundat
Life Science Division, Oak Ridge National Laboratory,
Oak Ridge TN 37831-6123

Abstract:
The advent of inexpensive, mass-produced microcantilevers, such as those used in atomic force microscopy, promises to bring about a revolution in the field of chemical, physical, and biological sensor development. The microcantilever resonance response such as resonance frequency, deflection, and Q-factor undergo variation due to external stimuli. The resonance response variation can be due to mass loading, surface stress or damping. When molecules adsorb on surfaces they can also produce a surface stress due to forces involved in the adsorption process. These surface stress can be observed as changes in deflections of a thin microcantilever. Microcantilever chemical sensors have been made by coating the cantilevers with selectively adsorbent film. For example, vapor detection of mercury, natural gas, and water vapor has been demonstrated with picogram sensitivity. Recent work has focused on the immobilization of antibodies and enzymes to microcantilevers. These bio-coated cantilevers have been used to detect analytes by either stress or heat-induced bending of the microcantilever. The arraying of bio-molecules on microcantilevers have great potential in high throughput screening applications.

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