

Publication

A chemical sensor based on a microfabricated cantilever array with simultaneous resonance-frequency and bending readout

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We present a chemical sensor based on a microfabricated array of eight silicon cantilevers actuated at their resonance-frequency and functionalized by polymer coatings. The operating principle relies on transduction of chemical or physical processes into a mechanical response. After exposure to analyte vapor, analyte molecules diffuse into the cantilever coating, which begins to swell. Jointly with the mass increase, a change of interfacial stress between coating and cantilever occurs, resulting in a bending of the cantilevers. Our setup allows the simultaneous detection of cantilever oscillation and bending of eight cantilevers by time-multiplexed optical beam deflection readout. The ac component of the cantilever response is demodulated, and the cantilever resonance-frequency is tracked by a custom-built phase-locked loop. By filtering out the ac component (oscillation), the de signal (bending) is extracted, yielding information on mass as well as surface stress changes simultaneously. Detection results of water, primary alcohols, alkanes and perfumes are presented. (C) 2001 Elsevier Science B.V. All rights reserved.

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