Investigation of the Electrochemical Potential-Induced Surface Stress by Metal-Coated Microcantilevers

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In recent years there has been a great interest in the development of chemical and biological sensors based on a microcantilever platform. When molecular adsorption is confined to one side of the cantilever, the cantilever undergoes deflection due to adsorption-induced stress. Although cantilevers are extremely sensitive they do not have any chemical selectivity. Chemical selectivity has been achieved by coating the cantilevers with a selective film on one side. Controlled potential electrochemical techniques, however, offer a simple means of achieving chemical selectivity. We have investigated the effect of controlled potential-induced surface stress on commercially available microcantilevers in an electrochemical cell. Microcantilevers coated with gold have been used as the working electrode to measure the current-potential response and simultaneous bending characteristics by cyclic voltammetry in electrolyte solution. The cantilever bending deflection is due to differential surface stress introduced by electrochemically-induced changes in the surface charge density. It is apparent that the microcantilever technique is very sensitive to potential change, ion adsorption/desorption and electron exchange at the surface of electrode. This micromechanical method shows promise for achieving chemical selectivity for sensor applications in liquid environments.