Finite Element Analyses of Cantilever Array Sensors

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Microfabricated cantilever arrays are emerging as label-free and real-time sensors for detecting tiny amount of various target molecules in parallel. Adsorption of analytes on a receptor layer coated on a cantilever surface induces surface stress, which makes the cantilever bend. This simple mechanics opened a myriad of possibilities for the use of atomic force microscopy (AFM) cantilever deflection technique beyond imaging. While applications ranging from chemistry to genomics have been demonstrated, a limited number of studies have been reported on the mechanics of the cantilever bending in conjunction with properties of coating layers. In this study, the influence of material properties (*e.g.* thickness, Young's modulus, Poisson's ratio, and density) of the coating layers on the deflection of a cantilever is simulated by a finite element method. It will provide an insight into the origin of surface stress as well as a guideline for the optimal coating layer for cantilever sensors.