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Microcantilever biosensing: A review and future perspective

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The microcantilever biosensors are becoming popular due to their inherent ability to generate highly sensitive and quantitative measurements with low cost, portability, real time and label-free detection. The capability of the microcantilever beams of detecting mechanical stress, mass additions and small forces offer encouraging prospects for physical and chemical sensing with high sensitivity and dynamic range. A microcantilever sensor normally operates in two modes: static and dynamic (Figure 1). In static mode a differential stress is induced from the molecular adsorption of analyte on microcantilever which leads to bending of microcantilever while as in the dynamic mode sensing or resonant mode sensing, binding induced changes in the cantilever resonant frequency are caused by mass change or stiffness change

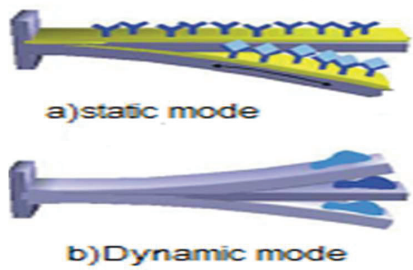

Figure 1: Modes of operation of cantilever [1]

Recently the microcantilever based sensors are becoming the most attractive candidates for early diagnosis of cancer. Cancer (malignant neoplasm) is a term for diseases in which the cells acquire genetic changes that lead to their uncontrolled growth, invade the nearby tissues and spread to other parts of the body. Most of the cancer types are not detected until they become incurable or cause enough pain. So detection of cancer at its early stage is of prime importance. Specific proteins are released by cancer tumors into the blood stream or other body fluids, these are known as cancer biomarkers and can be used to detect specific cancer at an early stage. Recently a new device of high accuracy has been fabricated (Figure 2) for liver cancer biomarker (AFP) detection and a piezoelectric microcantilever system is modeled for prostate specific antigen (prostate cancer).

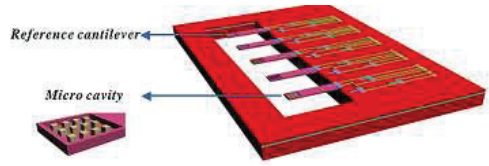

Figure 2: Microcantilever system for liver cancer biomarker [3]

Therefore, the microcantilever biosensors are growing towards nano scale range and have got tremendous future scope for the early detection of cancer and other diseases.

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