Design of MEMS-based Microcantilever for Tuberculosis Detection

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Abstract

Tuberculosis is infectious disease caused by various strains of Mycobacterium tuberculosis. The detection is very difficult because their mechanism is not well understood, and it is mainly based on the γ interferon which is normally secreted by the T-cell of the body. The RD1 region is genomic and is present in all strains of Mycobacterium tuberculosis. The ESAT-6/CFP-10 complex is secreted by the ESX-1 secretion system, also known as the RD1 region. It is expressed as a surface antigen. The fusion protein of ESAT-6/CFP-10 antibody is 24KDa. It interacts with the surface antigen and enables detection. The cantilever structure on silicon substrate with gold-coated film has been designed and simulated using COMSOL Multiphysics®. The simulation results include the stress, displacement measurements, Eigen function study, concentration optimization and the best suited type of cantilever for the detection.

Figures used in the abstract

Figure 1: schematic of rectangular shaped cantilever sensor
Figure 2: schematic of pi shaped cantilever sensor

Figure 3: schematic of triangular shaped cantilever sensor