Abstract

This technology proposes a sensor for detecting mechanical behaviors of cells. The present invention relates to a microelectromechanical system (MEMS) sensor device comprising at least one microelectromechanical system sensor to characterize intracellular dynamics and behavior of a living biological cell so as to quantitatively measure the mechanical strength. The microelectromechanical system sensor is responsive to mechanical force changes during said cell’s contraction, migration, proliferation and differentiation.

Problem solved with the technology

The present invention proposes the design and fabrication of an improved MEMS force sensor device that uses piezoresistive Silicon nanowire transducers. The invention provides a method to detect the cellular physical changes by measuring the change of resistance of piezoresistive nanowire. The advantages of this invention include,

* It is a label-free imaging method, reducing the sample preparation procedures that are very tedious and time consuming.
* The MEMS force sensor is small, with the dimensions of 20um x 20 um and forces measurement on the order of 100 nN, which has a good match to most mammalian cells.
* The invention is able to characterize dynamics changes of a biological cell. To achieve dynamics and contact measurements of basic biological processes in cells, a micro/nano sensing system can be used to measure small changes in force. The mechanical force changes during a cell’s contraction, migration, proliferation and differentiation is hence measured at nanonewton levels.
* The device provides microscale study of tissue components as well as the individual cells. The method provides a device with an array format, therefore at least one biological cell can be characterized when the contact is established.
**Potential Application**
This technology can be applied in biotechnology research. The method and system may be used to measure in-plane mechanical contact forces down to nanonewton range, such as for instance within the range of 100 n - 10 μN. Also, the miniaturized technology can be integrated with fluorescence microscope systems and hence provides a simultaneous data collection from both platforms. Furthermore, the invention can be used to measure the small displacements on the mechanosensitive platform.

**Customer Benefits**
The researchers or scientists could use this technology to characterize the cells' mechanical properties and understand sensing mechanism of force acting on cells. Also, this device is especially useful when the detailed analysis and high throughput quantitative screening of many cells are needed. Furthermore, this technology provides a sensitive measurement at micro/nano-scale.

**Additional Technical Information**


**Assignee:** Koç University

**Keywords:** Cell research, MEMS, cells mechanical strength

**KOÇ ÜNİVERSİTESİ**
Rumelihineri Yolu Sarıyer 34450
İstanbul, Türkiye
T: +90 212 338 12 77
tto@ku.edu.tr    tto.ku.edu.tr