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SU-8 Cantilever Integrated with Silicon Piezoresistive Sensor for Highly Sensitive Detection of Cardiomyocytes Contractility

HAOLAN SUN¹⁾, Dong-Su. Kim ¹⁾, Yun-Jin Jeong ¹⁾, Jong-Yun Kim ¹⁾, and Dong-Weon Lee^{1),2),†}

¹⁾*School of Mechanical Engineering, Chonnam National University, Gwangju, 61186, Republic of Korea*

²⁾*Center for Next-generation Sensor Research and development, Chonnam National University, Gwangju, 61186, Republic of Korea*

†mems@jnu.ac.kr

Abstract

Cardiovascular disease is the number one cause of death in humans, and the development of new drugs is a lengthy process. To effectively develop drugs, measuring contractility of cardiomyocytes (CMs) is also desirable to quantify drug toxicity. To detect the tiny contraction force of CMs, several bio-sensing devices have been developed, among which strain sensor-based flexible cantilever and diaphragm devices have received more attention. To overcome their low sensitivity of previous devices, we propose an SU-8 cantilever with an integrated silicon piezoresistive sensor for detecting CMs contractility in vitro. The sensing element on the SU-8 cantilever was made by using the repeated transfer technique of the silicon piezoresistive sensor. The high piezoresistive effect of the single-crystal silicon greatly improves the sensitivity of force detection. The SU-8 cantilever with integrated silicon piezoresistive sensor show a higher sensitivity (24 times) than the SU-8 cantilever with metal or composite strain sensors. Next, we will do cell experiments to demonstrate its stability and reliability. This device now looks promising for testing the CMs' contraction behavior in vitro.

Keywords: Silicon strain sensor, SU-8 cantilever, High sensitivity, Cardiomyocytes

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