Tactile Chemomechanical Transduction Based on Elastic Microstructured Array to Enhance the Sensitivity of Portable Biosensors

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Abstract

Tactile sensors capable of perceiving biophysical signals such as force, pressure, or strain have attracted extensive interests for versatile applications in electronic skin, non-invasive health care, and biomimetic prostheses. Despite these great achievements, they are yet incapable of detecting bio/chemical signals which provide even more meaningful and precise health information, due to the lack of efficient transduction principles. Herein, we propose a tactile chemomechanical transduction strategy that enables the tactile sensor to perceive bio/chemical signals. In this methodology, pyramidal tactile sensors were linked with biomarker-induced gas-producing reactions, which would transduce biomarker signals to electrical signals in real time. The method is advantageous as it enhances electrical signals by more than 10 fold based on a triple-step signal amplification strategy, as compared to traditional electrical biosensors. It also constitutes a portable and general platform capable of quantifying a wide spectrum of targets including carcinoembryonic antigen, interferon- , and adenosine. Such tactile chemomechanical transduction would greatly broaden the application of tactile sensors toward bio/chemical signals perception which can be used in ultrasensitive portable biosensors and chemical-responsive chemomechanical systems.

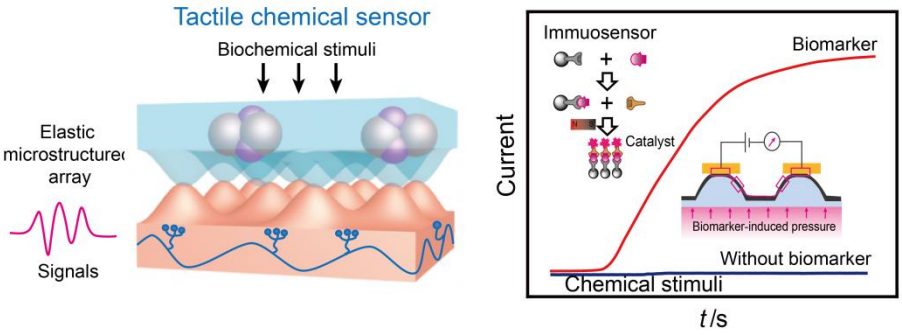

Figure 1: Scheme of tactile chemomechanical transduction based on elastic microstructured array.