

Nano-Biomimetic Cutaneous Sensor

Chang-Soo Han, Sungsoo Na, Kyung-Young Chun

School of Mechanical Engineering, Korea University
145 Anam Seongbuk, Seoul, Korea
cshan@korea.ac.kr

Extended Abstract

Development of low-power artificial sensors inspired by human mechanoreceptors is critical for restoring sensory functions that have been damaged or have deteriorated because of human aging and disability.[1] By means of mechanoreceptors for a variety of external stimuli, the skin's sensory organs generate a receptor potential, transmitted to the brain through the axon.[2] The brain can then distinguish types of external stimuli by means of two typical action potentials: slow adaption (SA) and fast adaption (FA) [3].

Here, we presents a self-powered mechanoreceptor nano sensor based on an artificial ion channel system combined with a piezoelectric film that can simultaneously implement FA and SA pulses like human skin. This device detects the stimuli with high sensitivity and broad frequency band without external power [4]. We applied this device to various applications such as reading braille, grabbing a sliding cup, identifying the surface roughness, and monitoring the blood pulse based on the fast- and slow-adapting signals. And we found that these two signals are very critical to recognize the kind of stimulus on a skin system. It opens the new scientific fields to realize the somatic cutaneous sensor of the real skin.

References

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