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Abstract

Tunable-sensitivity and flexibility are considered as two crucial characteristics for future pressure sensors or electronic skins. By the theoretical calculation model, we simulated the relationship curve between the sensitivity and PDMS pyramids with different spacings, and found that the spacing of pyramids is a main factor to affect the sensitivity of the capacitance pressure sensor. Furthermore, we fabricated the capacitance pressure sensors using graphene electrodes and the PDMS pyramid dielectric layers with different spacings. The measurement data were consistent with the simulation results that the sensitivity increases with the spacing of pyramids. In addition, graphene electrode exhibits prefect flexibility and reliability, while the ITO electrode would be destroyed rapidly after bending. These graphene pressure sensors exhibit the potential in the application in the wearable products for monitoring breath, pulse, and other physiological signals.

Keywords*:* graphene electrodes, pressure sensor, tunable sensitivity, flexibility.

1. Introduction

Recent years, flexible pressure sensor has attracted an amount of interest, owing to increasing demand over the last decades. Flexible pressure sensors could work as human's skin, and have potential in a lot of application fields, including robotic arms,[1-4] flexible electronic devices,[5-9] wearable devices,[10-14] health monitoring[15-18], human-machine interaction[19-21]. These pressure sensors have different sensing mechanics, including capacitive [11, 20, 22], resistive[21, 23, 24]，piezoelectric[25, 26] and so on. Among them, capacitive sensors have unique advantages in terms of stability, low power consumption and fast response. At present, scientists have been able to improve the sensitivity mainly by microstructure of electrode and dielectric layer.[4,27] Yong taek Hong reported that silver nanowires was covered on PDMS substrate with ripple structures as an electrode[27], and these pressure sensors achieved a high sensitivity ($3.8KPa^{-1}$). Later, they improved the sensitivity to 9.9 KPa^{-1} by the spacing structure