EuroSciCon

EuroSciCon Conference on

Nanotech & Nanobiotechnology

July 12-13, 2018
Paris, France

Nano Res Appl 2018, Volume 4
DOI: 10.21767/2471-9838-C2-012

DESIGN AND FABRICATION OF MICRO-PRESSURE SENSOR VIA CONDUCTING NANOPARTICLES

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Polydimethylsiloxane (PDMS) has played an important role in chip fabrication owing to its properties such as transparency, biocompatibility, and good flexibility. However, PDMS is a non-conducting polymer, on which patterning metallic structures during the fabrication is challenging due to the weak adhesion between metal and PDMS. Hence, the integration of conducting structures into bulk PDMS was a critical issue. Here, we introduce PDMS-based conducting composites synthesized by mixing conductive nano/micro-meter-sized particles with PDMS gel, with which the patterning of the conductive structure can be realized by soft lithographic approach. Experiments show that such composite material can be perfectly constructed into PDMS bulk material in all cases, thereby greatly enhancing their potential functionalities. By employing above conducting composite for the fabrication of electrodes, some applications for the on-chip signal control and monitoring becomes feasible, for example, micro pressure sensor has been designed and fabricated. The micro pressure sensor presented here is a deformable thin conducting membrane attached on the wall of a microfluidic channel and its line resistance can be tunable under the external pressure variations. The testing results show that a good linear relationship between line resistance of sensor and applied pressure can be obtained which is a desired property of pressure sensor.

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