

Elastomeric nanowire composite for tunable flexible pressure sensors

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Wearable electronics have gained huge interest nowadays, because of their versatile applications such as human-machine interface, real-time health monitoring, patient rehabilitation and wearable displays. Flexible pressure sensor or tactile sensor, one of the core device of wearable electronics, has been widely investigated due to its multifunctional application to wearable electronics. Flexible pressure sensors can detect wide range pressure from gentle touch (<10kPa) to body pressure mapping (>1MPa) and even very small pressure (<10Pa). Based on these properties, flexible pressure sensors can be applied to human-machine interfaces, next generation touch interfaces for wearable displays and real-time monitoring of blood pressure.¹ For these applications, pressure sensors must have high pressure sensitivity, flexibility, stability and also tunable sensitivity like human skin. Because pressure sensors with customized sensitivity suitable for each application are desirable, the tunable pressure sensitivity of the sensor is needed.²

Recently, our group reported a capacitive flexible pressure sensor with elastomeric nanowire composite.³ However, the pressure sensitivity of the reported sensor was fixed and not tunable. In this paper, we report highly sensitive and flexible pressure sensor with tunable sensitivity. Silver nanowires (AgNWs) embedded polydimethylsiloxane (PDMS), the elastomeric nanowire composite, was integrated with polymeric dielectric layer and printed electrode to obtain capacitive pressure sensor as shown in Fig.1. By controlling the mechanical property of the matrix PDMS of the nanowire composite, we can tune the pressure sensitivity of the sensor easily. The sensor also shows high sensitivity (sensitivity > 3kPa⁻¹) and high bending stability (r~5mm, < 10% degradation).

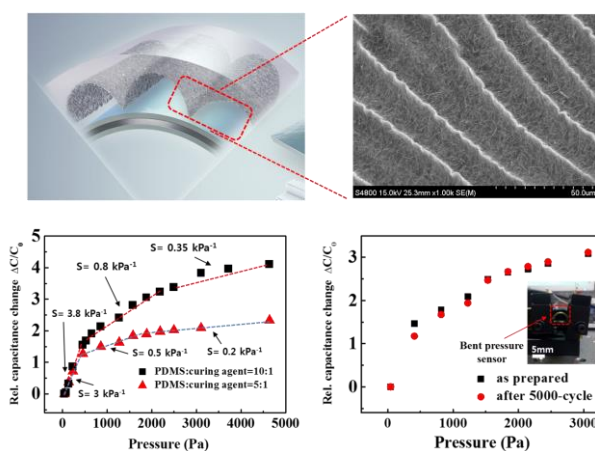


Fig. 1. Schematic illustration of the capacitive pressure sensor and the tunable pressure sensitivity and bending stability of the pressure sensor

Acknowledgment

This work was supported by the Center for Advanced Soft-Electronics funded by the Ministry of Science, ICT and Future Planning as Global Frontier Project, Korea (Code No. 2012M3A6A5055728)

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