Printed temperature sensor based on PEDOT:PSS

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【Introduction】

Printed sensors have attracted intensively research interesting due to their superiority in mass manufacturing as well as the application in wearable health-care systems. [1, 2] Among printed sensors, the printed temperature sensors are of importance, since the monitoring human body temperature provided an insight on human health condition, such as cardiovascular condition, cognitive state, pulmonological diagnostics and other syndromes. [1, 3] High sensitivity is one of the major concerns for temperature sensor, however, still a challenge for most of the reported printed devices. Herein, we developed a poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) (PEDOT:PSS)-based printed temperature sensor, which exhibited a negative temperature coefficient of resistance (TCR) as high as -1%°C^{-1}.

【Results and discussion】

Temperature measurement is commonly relying on the thermoresistive effect. To monitor body temperature accurately, thermistor with high temperature coefficient of resistance (~±1% °C^{-1}) at the sensing range of 25-50 °C was required in a typical temperature sensor circuit (Fig. 1a). PEDOT:PSS is promising candidate due to its considerable thermoresisive effect and turnable electronic and processing properties, however, used to suffer from the low reproducibility of fabrication process. [4 We screened different type of PEDOT:PSS and investigated the effects of additives such as Triton X-100, to realize a balance point with both high sensitivity and good reproducibility (Fig.1b). The printed sensor devices exhibited a negative TCR as high as -1% °C^{-1} from 25 °C to 50 °C with good reproducibility, even under the ambient condition. Our work may provide a materials design strategy for high sensitive printed temperature sensors. Further study on the flexibility and humidity stability is in processing.

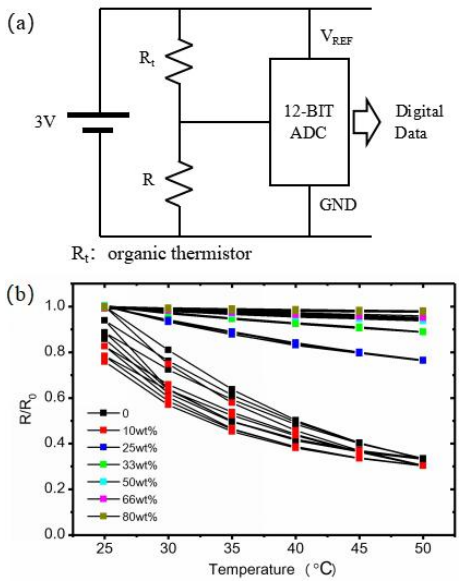

Fig.1 (a) Typical temperature sensor circuit with a thermistor. (b) Normalized resistance as a function of temperature of 3 cycles for sensors with varying concentration of Triton X-100.

References

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