Wearable Strain Sensors with Silver Nanowires for Health Monitoring

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Stretchable and wearable strain sensors have grown to prominence in recent years due to its wide-ranging potential applications in health-monitoring devices, human motion detection, and soft robots. High aspect ratio (AR) silver nanowires (AgNWs) have shown great potential in the wearable strain sensors due to the high conductivity and flexibility of AgNW conductive networks. Hence, this work aims to fabricate wearable kirigami strain sensors with high AR AgNWs. The AgNW synthesis parameters and process windows have been identified by Taguchi design of experiment and analysis. Long AgNWs with high AR of ~1556 have been grown at optimized synthesis parameters by a one-pot modified polyol method. Kirigami sensors were fabricated via full encapsulation of AgNWs with Ecoflex silicon rubber. The kirigami strain sensors show high stretchability of 70% with linear response. The sensors can detect finger bending with no hysteresis, which can find potential applications in wearable sensors for human health monitoring, such as muscle rehabilitation. In order to improve the sensitivity, stretchability, and linearity of the strain sensor simultaneously, future work can be done to study the effect of AR and length of AgNWs on the performance of the strain sensor, and to optimize the kirigami patterning of AgNW electrodes.

Awards Won:

Fourth Award of $500