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Wearable Piezotronic Devices for Heart Rate Monitoring

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ABSTRACT

Self-powered multifunctional wearable devices that are capable of human-device interfacing are highly desired. Piezotronic devices utilize piezoelectricity and semiconductor properties to enable devices to have seamless interaction between human and device. One important use for piezotronic devices is for pressure sensing. Pressure sensing devices have been employed in smart skins, biomonitoring, gesture recognition, and many more applications. This study aims to create a flexible piezotronic device, specifically for use in pressure sensing to monitor heart rate. ZnO nanowires are grown on a flexible polymer substrate so that they can be made into wearable devices. A p-n heterojunction is formed by depositing a layer of p-type tellurium nanowire on top of the ZnO nanowires. These wearable devices are capable of performing the above mentioned tasks through the piezotronic effect that effectively modulates the electronic transport through the p-n junction. One function in particular is heart rate monitoring. This could be an extremely useful and minimally invasive way of detecting heart diseases such as arrhythmia.

KEYWORDS

Piezotronic, pressure sensing, wearable devices, flexible, piezoelectric semiconductor nanomaterials