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Biodegradable Elastic Polymers Are Used to Create Stretchable Piezoresistive Strain Sensors

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Abstract : Huge amounts of e-waste are being produced by the rapidly expanding use of electronics; the majority of this material is either burned or dumped directly in landfills since recycling would either be impracticable or too expensive. Degradable and environmentally friendly materials are therefore seen as the answer to this urgent problem. Here, we create strain sensors that are biodegradable, robust, and incredibly flexible using thin films of sodium carboxymethyl cellulose (NaCMC), glycerol, and polyvinyl alcohol (PVA). Due to the creation of many inter- or intramolecular hydrogen bonds, the polymer blends (NaCMC/PVA/glycerol) exhibit a failure strain of up to 330% and negligible hysteresis when exposed to cyclic stretching-releasing. What's more intriguing is that the sensors can degrade completely in deionized water at a temperature of 95 °C in about 25 minutes. This project illustrates a novel method for developing wearable electronics that are environmentally beneficial.

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