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Abstract

Self-Healable Ultra-Stretchable Wearable Sensor Materials

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Abstract:
Wearable strain sensors are essential for the realization of applications in the broad fields of remote healthcare monitoring, soft robots, immersive gaming, among many others. These flexible sensors should be comfortably adhered to skin and capable of monitoring human motions with high accuracy, as well as exhibiting excellent durability. However, it is challenging to develop electronic materials that possess the properties of skin. The presented skin-like electronic material exhibits ultra-high stretchability, repeatable autonomous self-healing ability, quadratic response to strain, and linear response to flexion bending. This conductive polymer system, under ambient conditions, synergistically constructs a regenerative dynamic polymer complex crosslinked by hydrogen bonds and electrostatic interactions, which enables these unique properties. Sensitive strain-responsive mechanisms owing to the homogenous and viscoelastic nature provide unidirectional tensile strain and bending deformations. Furthermore, this material is scalable and simple to process in an environmentally-friendly manner, paving the way for the next generation wearable sensors.

Biography:
Evan K. Wujcik is currently an Assistant Professor in the Department of Chemical and Biological Engineering and an Adjunct Professor in the Department of Civil, Constructions, and Environmental Engineering at the University of Alabama (Tuscaloosa, AL, USA), where he directs the Materials Engineering and Nanosensor (MEAN) Laboratory. He obtained his Ph.D. in chemical and biomolecular engineering from The University of Akron (2013) and his MBA in 2011, M.S. in chemical engineering (2009), B.S. in applied mathematics (2010), and B.S. in chemical engineering (2008) from The University of Rhode Island. His research interests include stretchable electronics. advanced materials, polymers, fibers, electrospinning, and sensors.

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