Highly Piezosensitive, Biocompatible Ionogel for Implantable Health Monitoring Device

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According to increased demands on Point-Of-Care technology, wearable and implantable bioelectronics has been developed for offering the precise tactile bio-signal in real-time. However, traditional bio-signal sensors are mainly composed of metal and inorganic materials, which lead to low sensitivity and signal-to-noise (SNR) because of poor body compatibility. Herein, we demonstrate biocompatible ionogel (bionogel) composed of chitosan biopolymer and choline-derived ionic liquids, which exhibit soft mechanical properties and low cytotoxicity without affecting the viability of the human tissues. Moreover, to enhance pressure sensitivity, we introduced gold nanoparticles (AuNP) in which ions can be confined on the surface of AuNP by hydrogen-bond. The confined ions can be dissociated by Von Mises stress concentration effect, which shows the dramatic change of the free ions in polymer matrix. Thanks to this ion trap and release dynamics, bionogel can exhibit superior sensitivity toward pressure compared to conventional sensors that are based on structural deformation mechanisms. We believe our novel material design would open up new avenues in implantable health monitoring devices.