

## **Description of Additional Supplementary Files**

### **File Name: Supplementary Data 1**

Description: The atomic coordinates of the Gaussian simulation optimized computational models among Fe ions ( $\text{Fe}^{3+}$ ,  $\text{Fe}^{2+}$ ) and gelatin, chitosan, alginate, starch, PAAm, and PVA. Fe (x), x represents the valence state of Fe ions, including Fe (III) and Fe (II).

### **File Name: Supplementary Movie 1**

Description: Photo-detachable adhesion properties of the CNF-DA/PAA@ $\text{Fe}^{3+}$  hydrogel. CNF-DA/PAA@ $\text{Fe}^{3+}$  hydrogel seamlessly adheres to porcine skin, and the hydrogel peels off easily after UV irradiation.

### **File Name: Supplementary Movie 2**

Description: Adhesion properties of the CNF-DA/PAA@ $\text{Fe}^{3+}$  hydrogel. The CNF-DA/PAA@ $\text{Fe}^{3+}$  hydrogel can adhere to 20 g of steel balls. During the return movement, the steel balls are tightly bonded and do not fall off.

### **File Name: Supplementary Movie 3**

Description: Conductivity properties of the CNF-DA/PAA@ $\text{Fe}^{3+}$  hydrogel. A light-emitting diode (LED) can be lighted cyclically with a easy capacity when the CNF-DA/PAA@ $\text{Fe}^{3+}$  hydrogel acts as an ionic conductor, proving it possesses excellent ionic conductivity and sensitivity.

### **File Name: Supplementary Movie 4**

Description: Sensing properties of the CNF-DA/PAA@ $\text{Fe}^{3+}$  hydrogel. When the CNF-DA/PAA@ $\text{Fe}^{3+}$  hydrogel is adhered to the human wrist and bent, repeatable resistance responses with a high signal-to-noise ratio are also obtained, demonstrating a long service life and good reliability of hydrogel.

**File Name: Supplementary Movie 5**

Description: PdA-TENG properties of the CNF-DA/PAA@Fe<sup>3+</sup> hydrogel. When the CNF-DA/PAA@Fe<sup>3+</sup> hydrogel is assembled into a self-powered electronic skin, the light-emitting diode (LED) can easily cycle to emit light after continuous tapping of the sole of the foot, demonstrating its excellent electrical output performance.

**Supplementary Movie 6**

Description: Wireless-sensing properties of the CNF-DA/PAA@Fe<sup>3+</sup> hydrogel. When PdA-TENG is applied to wireless sensors, electrical signals of human body movement can be accurately collected.