**Transparent and Anti-freezing PVA Organohydrogels through one-step physical crosslinking for ionic skin sensors**

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Abstract

Conductive hydrogels, as a class of intrinsically stretchable and conductive material, have recently attracted tremendous research interests for potential applications in electronic skin, soft robotics, and wearable devices. However, traditional conductive hydrogel consisting of colored polymer and carbon nanomaterials are unsuitable for practical applications in skin-mountable devices due to their poor biocompatibility, low transparency and unsatisfactory mechanical performance. Herein, biocompatible polyvinyl alcohol (PVA)/glycerol-water organohydrogel with high transparency (80%) and large stress (1.4 MPa) is developed via a one-step physical crosslinkning strategy, enabling sensitive strain sensing ability in a wide temperature range. The PVA organohydrogel shows high linear sensitivity (GF is 1.6 ) for 0~300% strain, fast response and relaxation times (< 270 ms) and good repeatability (50% strain, 900 cycles). Various human motions corresponding to different strain levels are monitored by the strain sensor from −18 to 25 °C. This work sheds light on the fabrication of physically crosslinked biocompatible organohydrogels with stable, high mechanical performance and high linear strain sensitivity for the applications of emerging wearable electronics.

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