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Transparent Photovoltaic Skin for Artificial Thermoreceptor and Nociceptor Memory

Authors : Priyanka Bhatnagar, Malkeshkumar Patel, Joondong Kim, Joonpyo Hong

Abstract : Artificial skin and sensory memory platforms are produced using a flexible, transparent photovoltaic (TPV) device. The TPV device is composed of a metal oxide heterojunction (nZnO/p-NiO) and transmits visible light (> 50%) while producing substantial electric power (0.5 V and 200 μA cm-2). This TPV device is a transparent energy interface that can be used to detect signals and propagate information without an external energy supply. The TPV artificial skin offers a temperature detection range (0 □C□75 □C) that is wider than that of natural skin (5 □C□48 °C) due to the temperature-sensitive pyrocurrent from the ZnO layer. Moreover, the TPV thermoreceptor offers sensory memory of extreme thermal stimuli. Much like natural skin, artificial skin uses the nociceptor mechanism to protect tissue from harmful damage via signal amplification (hyperalgesia) and early adaption (allodynia). This demonstrates the many features of TPV artificial skin, which can sense and transmit signals and memorize information under self-operation mode. This transparent photovoltaic skin can provide sustainable energy for use in human electronics.

Keywords : transparent, photovoltaics, thermal memory, artificial skin, thermoreceptor
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