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PROCEEDINGS

Mechanism Analysis of Thermal Pain and Mechanical Matching of Stretchable Bio-Integrated Devices Integrated on Biological Tissues

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ABSTRACT

As a new type of electronic device, stretchable bio-integrated devices are generally composed of inorganic functional components, stretchable interconnected structures, soft biocompatible substrates and encapsulations, and have wide adaptability to a variety of complex surfaces of soft biological tissues. The small size of functional components, the thin substrate thickness, and poor thermal conductivity can easily lead to thermal burns caused by local temperature concentration in biological tissues. The unique microstructure characteristics and biological thermal characteristics of biological tissues make the heat transfer behavior of integrated devices in biological tissues significantly different from the traditional Fourier heat transfer law. In order to achieve adaptability to complex curved surfaces, the non-uniform deformation of the device is necessary, which will lead to the shear of the interface between the device and the skin. Especially, when the overall stress-strain characteristics of the device do not match the biological tissue, this mechanical mismatch will be more serious. In this presentation, the thermal pain and mechanical matching problems encountered in the application of flexible inorganic integrated electronic devices are discussed. Additionally, it is necessary to analyze the mechanism of thermal pain and mechanical matching of stretchable bio-integrated devices when they are closely attached to biological tissues and propose the corresponding device design guidance.

KEYWORDS

Stretchable bio-integrated devices; biological tissues; thermal pain and mechanical matching; mechanical mismatch

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