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A novel 3D bioprinted flexible and biocompatible hydrogel bioelectronic platform

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Highlights

- Use of 3D bioprinting to fabricate the platform in one single step.
- Direct write of bio- and electronic material inks with tailored properties.
- Materials are functional as soon as they are printed and require no post processing.
- Full spatial control of the electronic circuit and design through printing.
- Demonstrated a freestanding, flexible and biocompatible bioelectronics platform.

Abstract

Bioelectronics platforms are gaining widespread attention as they provide a template to study the interactions between biological species and electronics. Decoding the effect of the electrical signals on the cells and tissues holds the promise for treating the malignant tissue growth, regenerating organs and engineering new-age medical devices. This work is a step forward in this direction, where bio- and electronic materials co-exist on one platform without any need for post processing. We fabricate a freestanding and flexible hydrogel based platform using 3D bioprinting. The fabrication process is simple, easy and provides a flexible route to print materials with preferred shapes, size and spatial orientation. Through the design of interdigitated electrodes and heating coil, the platform can be tailored to print various circuits for different functionalities. The biocompatibility of the printed platform is tested using C2C12 murine myoblasts cell line. Furthermore, normal human dermal fibroblasts (primary cells) are also seeded on the platform to ascertain the compatibility.

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Keywords

Bioelectronic; Bioprinting; Bioink; Hydrogel; Electrode; Flexible; Biocompatible; Heating coil

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