

Multifunctional Cell-Culture Platform for Monitoring and Transfer Printing of Cell Sheets

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The development of cell-culture platform equipped with stretchable electronics to embrace *in vitro* cell cultures, directional organizations, and physiological monitoring as well as *in vivo* applications in tissue regeneration has been an overarching goal. Although many concepts of platforms for cell culturing has been studied, an integrated system featured with these multi-functionalities is not reported yet. Here, we present an instrumented cell-culture platform, composed of nano-membrane sensors and graphene nanoribbons on a soft elastomeric substrate. Main objectives are i) inducing aligned cellular proliferation and differentiation on graphene nanoribbons, ii) monitoring cellular activities *via* soft nano-membrane sensors, iii) effectuating the muscle-on-a-chip as an *in vitro* testing tool, and iv) performing cell sheet treatments using new transfer printing techniques. This development would contribute to broadening the applicability of tissue engineering and regenerative medicine.