

Microfluidic devices and systems for bio-mimic approaches of stem cells

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Understanding and mimicking the in-vivo stem cell processes are active endeavor toward clinical and industrial applications.

By using nanofabrication and microfluidic techniques, we fabricated monolayer nanofibers as culture substrates and elastoplastic devices as tissue integration platforms for human induced pluripotent stem cells based assays. Functional cardiomyocytes and neurons were obtained on the monolayer nanofibers showing the expected electrophysiological behaviors and drug responses. An automatic system has also been developed for bio-mimic and long-term regulation of the stem cell differentiation and culture conditions.

Together, we have established a new paradigm for the future studies and developments of stem cell based assays, disease modeling, drug screening and regenerative medicine.

Finally, we believe that the concepts and the device manufacturing techniques developed in this work will also be useful for the exploration of microfluidic technologies in general.