

## Electronic Supplementary Information

### Liquid metal-polydopamine composite for cell culture and electro-stimulation

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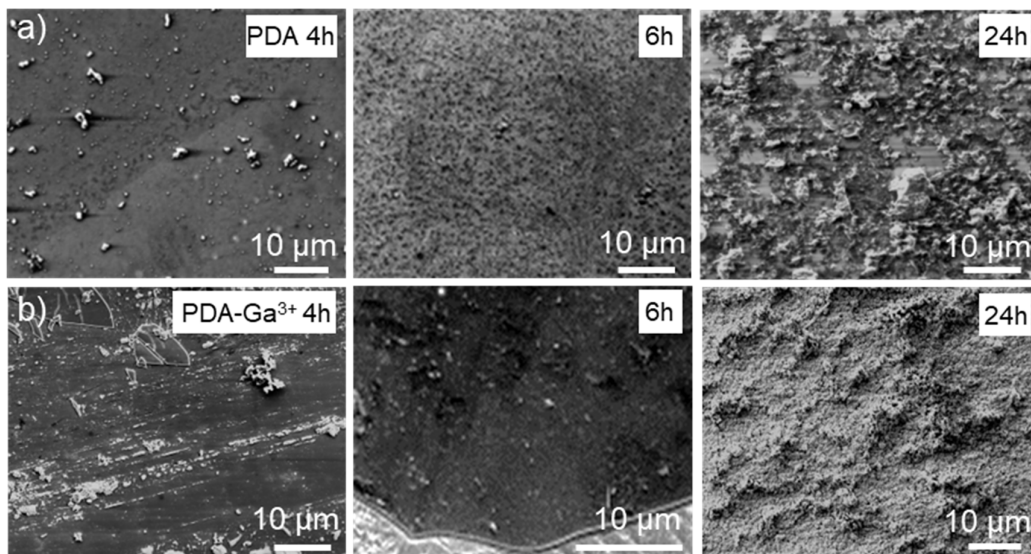
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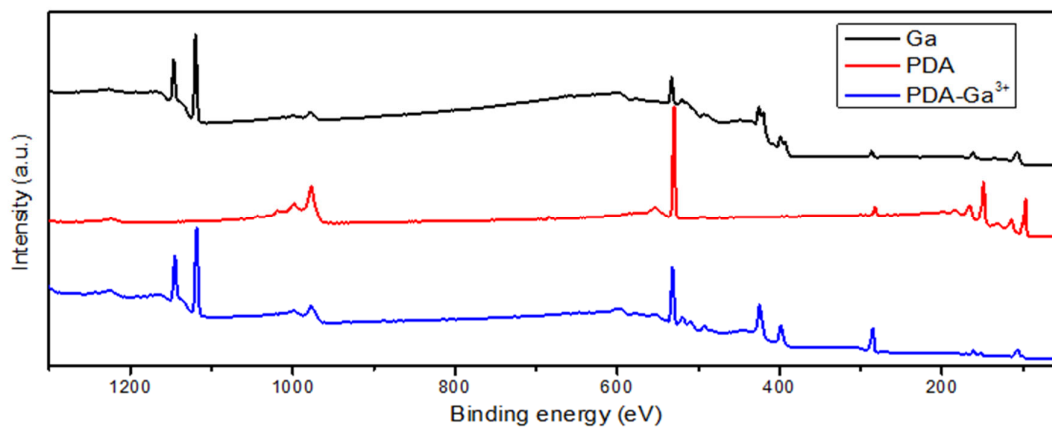
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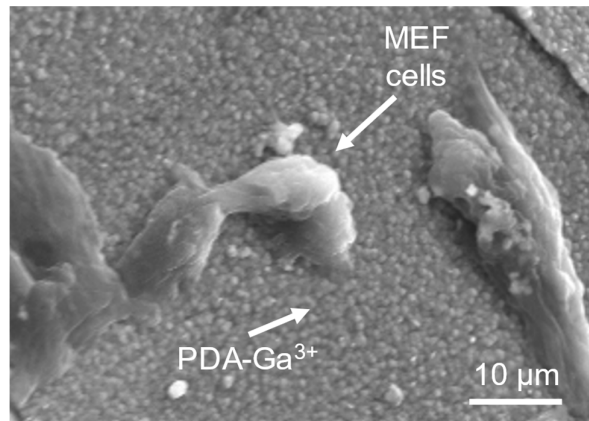
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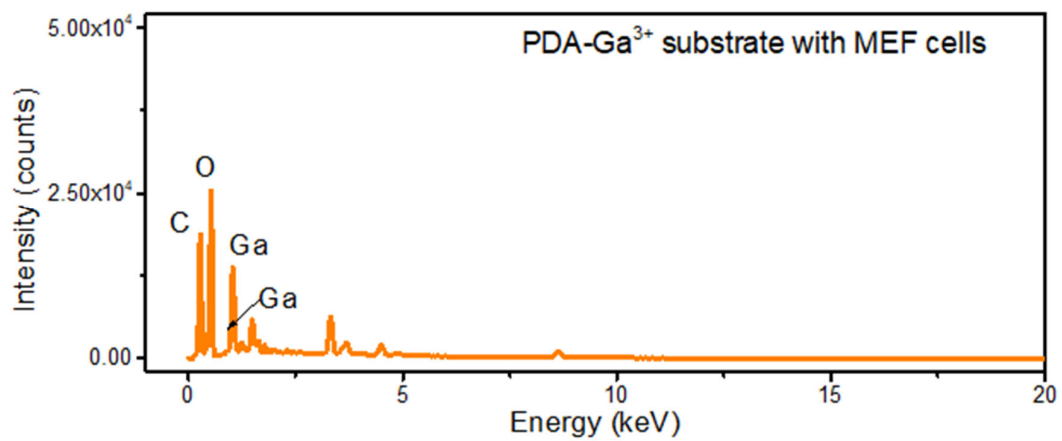
**Fig. S1** (a) SEM images of the PDA coating on Si/SiO<sub>2</sub> substrates after 4, 6 and 24 hours of reaction. (b) SEM images of the PDA-Ga<sup>3+</sup> coatings on the Ga coated substrates after 4, 6 and 24 hours of reaction.



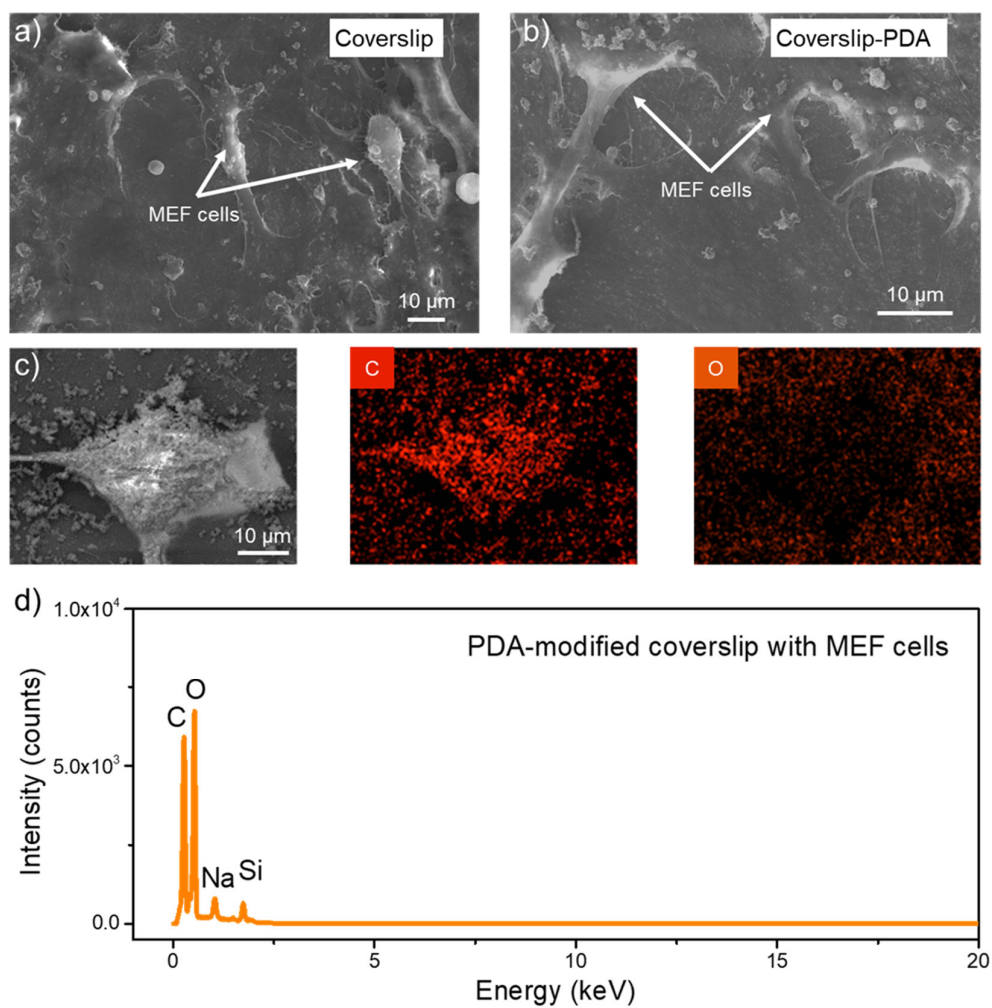
**Fig. S2** XPS survey spectra of the Ga, PDA and PDA-Ga<sup>3+</sup> coated substrates.



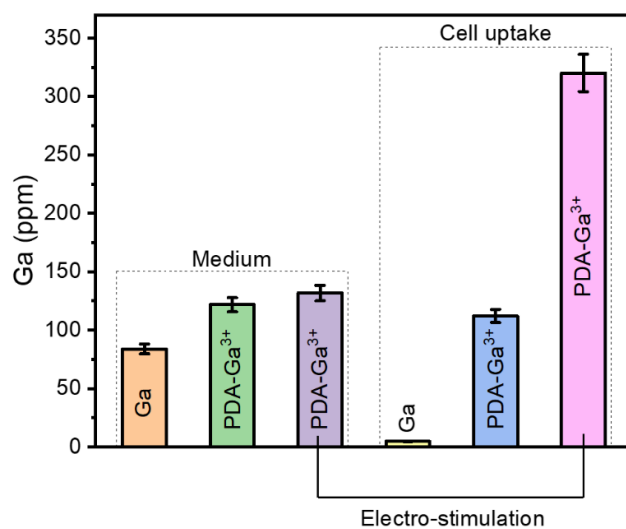
**Fig. S3** SEM image of MEF cells adhering and growing on the PDA-Ga<sup>3+</sup> substrate.



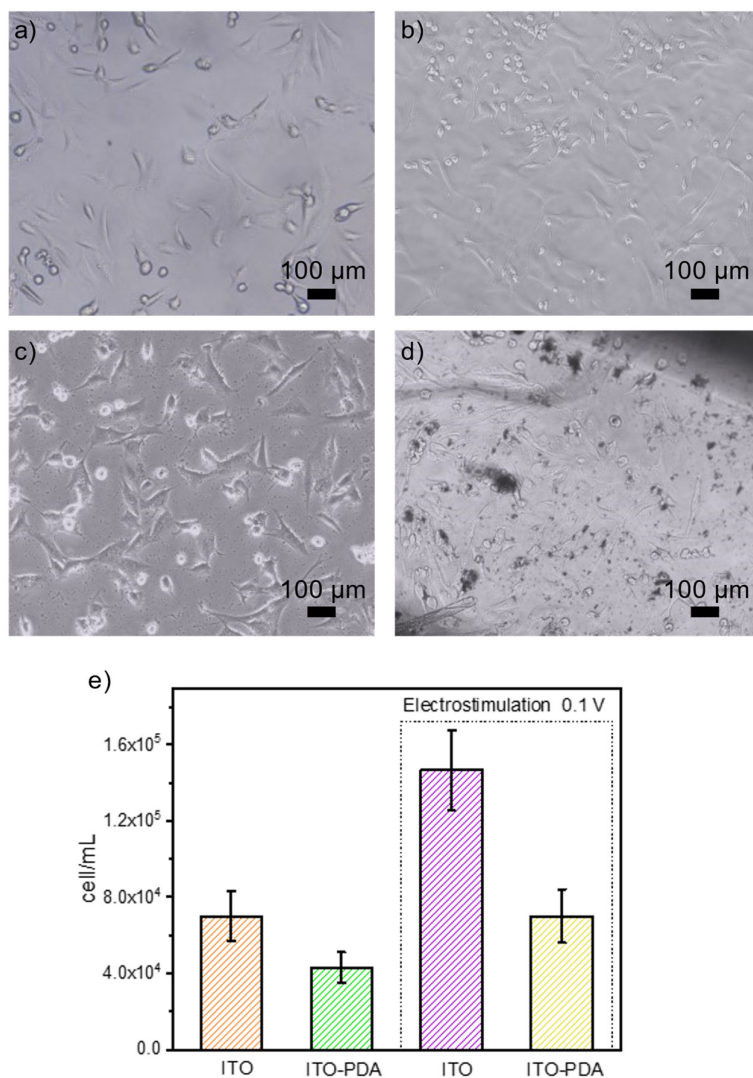
**Fig. S4** EDX spectrum associated with the SEM/EDX elemental mapping of the PDA-Ga<sup>3+</sup> substrate with attached MEF cells after 24 hours growth experiment presented in Figure 5(d).



**Fig. S5** SEM images of the MEF cells attached on (a) unmodified coverslip and (b) PDA coated coverslip after 24 hours incubation time. (c) SEM/EDX elemental mapping of a MEF cell attached on a PDA modified coverslip after 24 hours incubation time, and (d) associated EDX spectrum.

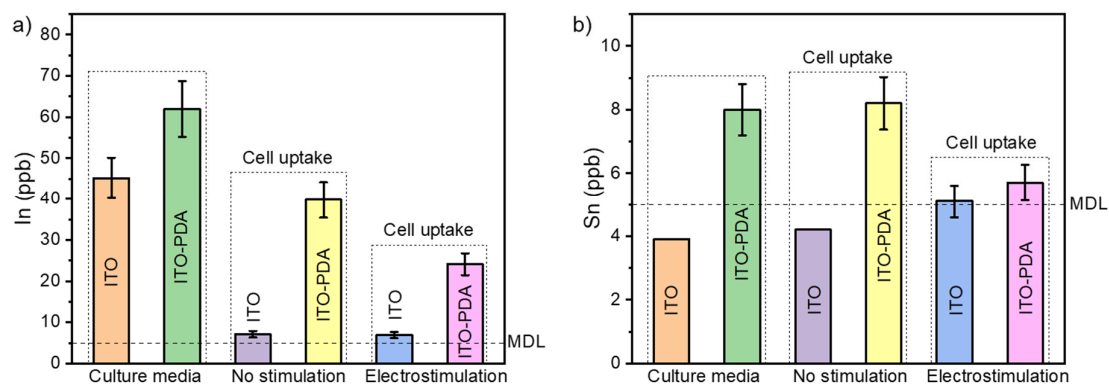


**Fig. S6** Concentration of elemental Ga in parts per million (ppm) as analysed by ICP-OES in the DMEM culture media, and quantified in the MEF cells following incubation with and without electro-stimulation protocol. The MDL (method detection limit) for elemental Ga is 0.05 ppm.



**Fig. S7** Optical images of the MEF cells attached on the (a): ITO glass, (b): PDA-modified ITO glass after 48 hours of incubation. Optical images of the MEF cells after electrostimulation protocol on the ITO glass (c) and on the PDA-modified ITO glass (d). (e): MEF cells concentration after 48 hours of incubation on the ITO substrates.





**Fig. S8** Concentration of elemental In (a) and elemental Sn (b) in parts per billion (ppb) as determined by ICP-OES in the DMEM culture media and subsequently quantified in the MEF cells. The method detection limit (MDL) represents the minimum concentration of an element that can be detected with 99% certainty.