Supporting Information

A cross-linkable and resorbable PEDOT-based ink using a hyaluronic acid derivative as dopant for flexible bioelectronic devices

Maxime Leprince[a,b], Simon Regal[c], Pascal Mailley[a], Fabien Sauter-Starace[c], Isabelle Texier[a*], Rachel Auzély-Velty[b]

[a] Univ. Grenoble Alpes, CEA, LETI, DTBS, F-38000 Grenoble, France

[b] Univ. Grenoble Alpes, CNRS, CERMAV, F-38000 Grenoble, France

[c] Univ. Grenoble Alpes, CEA, LETI, CLINATEC, F-38000 Grenoble, France

1. Synthesis of the PEGene derivative

PEGene was synthesized in two steps from *O*-(2-aminoethyl)-O′-[2-(Boc-amino)ethyl] deca(ethylene glycol) (Figure S1).

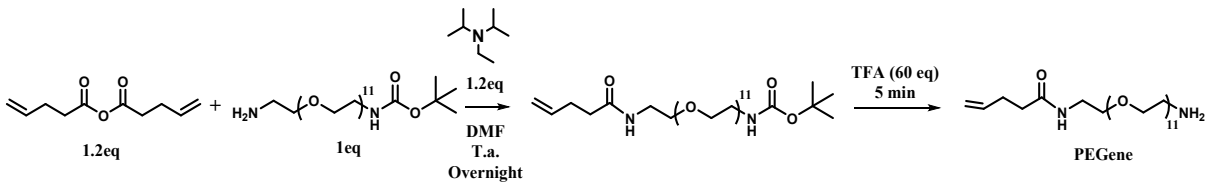

Figure S1. Synthesis of PEGene

1 g of O-(2-aminoethyl)-O′-[2-(Boc-amino)ethyl]deca(ethylene glycol) was dissolved in 185 mL of DMF with 340 µL of pentenoic anhydride (1.2 equivalents) and 324 µL of N,N-diisopropylamine (1.2 equivalents). The mixture was stirred overnight at room temperature. DMF was evaporated, and the resulting yellow oil was purified on chromatography column (silica gel; dichloromethane/methanol 95:5 (v/v)) to yield to AP-NH-(PEG)11-NH-Boc as a yellowish oil (90 % yield). Then, the product was treated by 7.169 mL of pure trifluoroacetic acid (60 equivalents) were added dropwise to AP-NH-(PEG)11-NH-Boc and stirred strongly for 5 minutes. The mixture was then quickly cooled down on ice and 70 mL of NaOH 1 M were added slowly under strong stirring. The pH was adjusted to 4.5. The mixture was then charged on a column filled with ion exchange resin AG-MP50® from BioRad (Milan, Italy) and rinsed with 100 mL of water at pH 4.5, then 300 mL of water. The unprotected amine was released from the resin eluting with ammonium hydroxide at 4 v/v%, and isolated by evaporation, yielding to PEGene as a yellow solid with a total yield in two steps of 80.5 %.

^{1}H NMR of PEGene (400 MHz, D_2O, 25 °C): 5.95-5.82 (1H, =C*H*), 5.17-5.04 (2H, =CH_2), 3.82-3.60 (44H, -CH_2O), 3.44-3.39 (2H, -CH_2-NHCO), 2.93-2.87 (2H, -O-CH_2-CH_2-NHCO), 2.42-2.34 (4H, CH_2-CH_2-CO).

2. ^{1}H NMR spectrum of HAS-PBA-PEGene

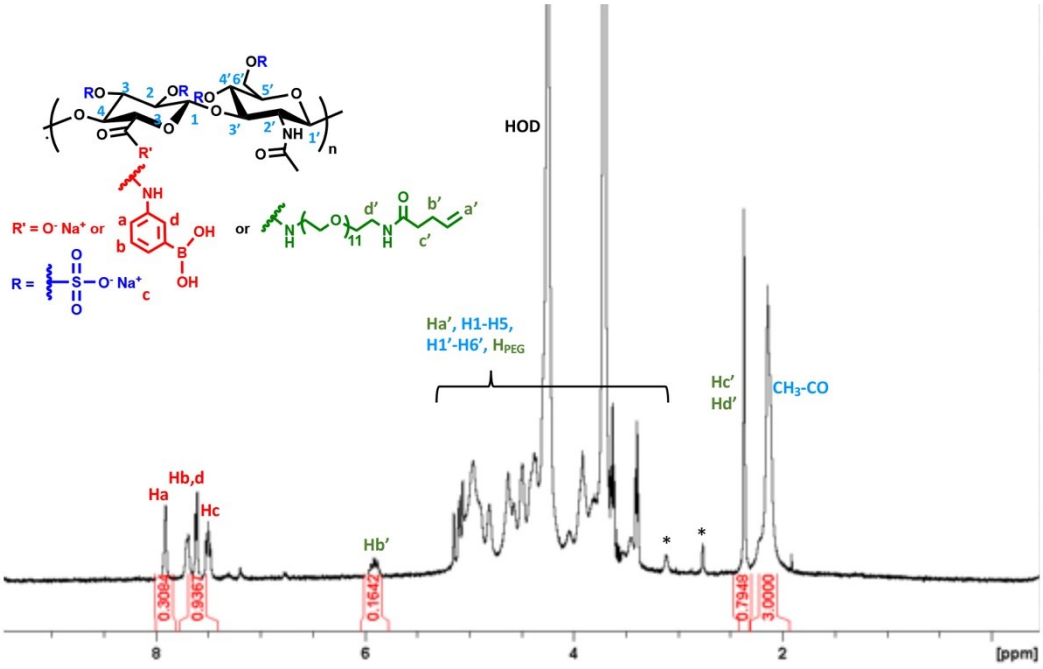

Figure S2. ^{1}H NMR spectrum (400 MHz, D_2O, 4 mg/mL, 80 °C) of HAS-PBA-PEGene (DS_{PBA} = 0.3 and DS_{PEGene} = 0.17). The signal labeled by a star correspond to traces of DMTMM.

3. Optical microscopy observation of PEDOT:HAS-PBA-PEGene film produced by inkject printing

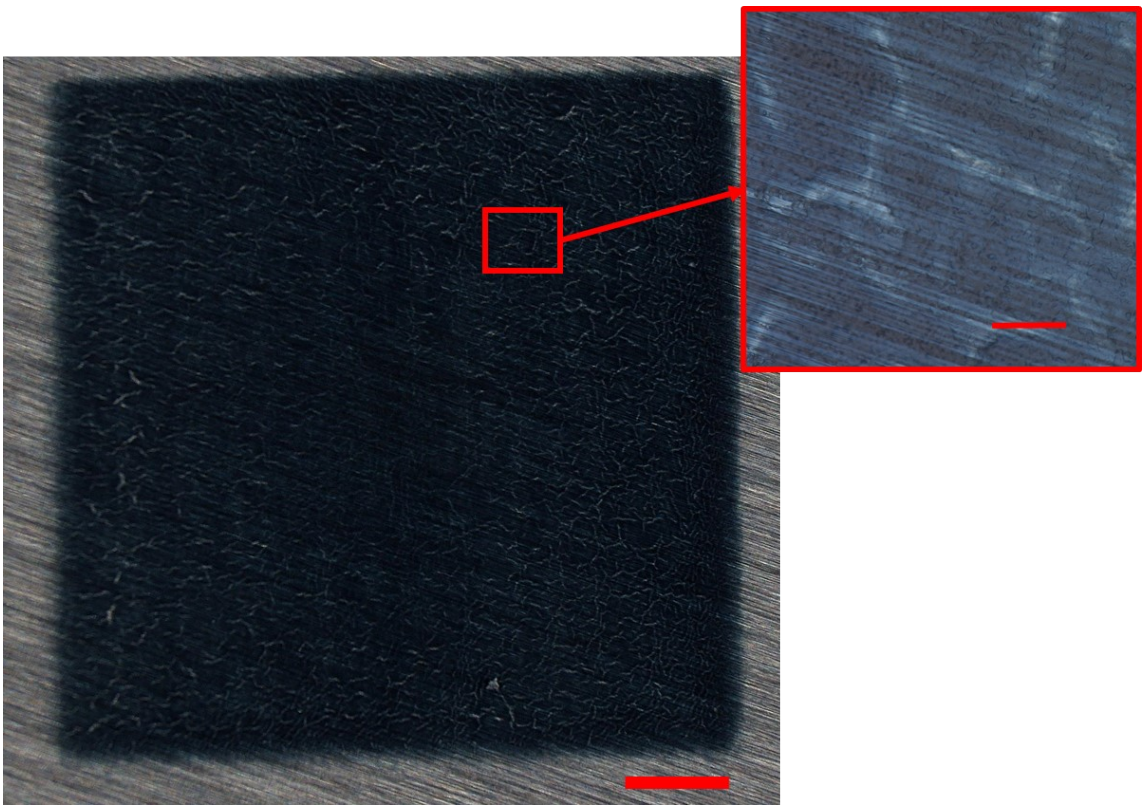

Figure S3. 7x7 mm² square of PEDOT:HAS-PBA-PEGene printed on PLGA film (scale bar = 1 mm). Insert image: enlargement of the print (scale bar = 50 µm). Some cracks can be observed inside the printed film.

4. Optical digital microscopy observation of PEDOT:HAS-PBA-PEGene tracks after encapsulation between PLGA layers

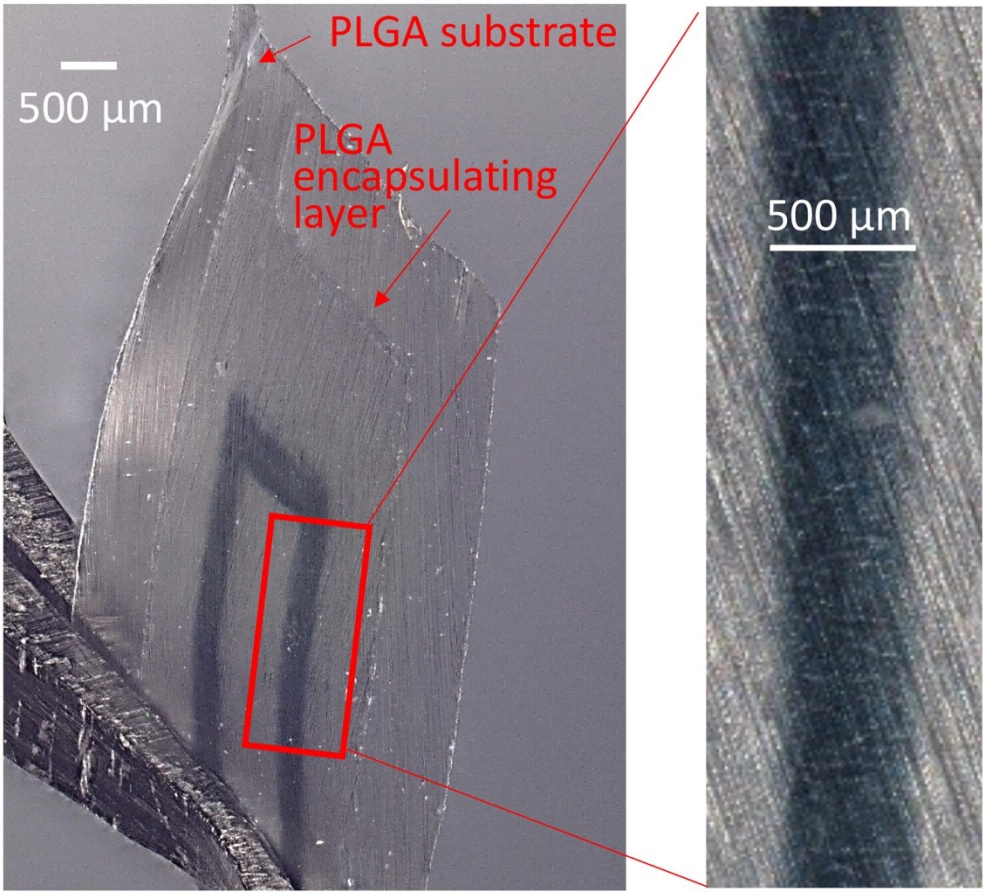

Figure S4. Optical microscopy images of PEDOT:HAS-PBA-PEGene tracks encapsulated with PLGA (observation with a Keyence digital microscope VHX 7000).

5. Cell viability

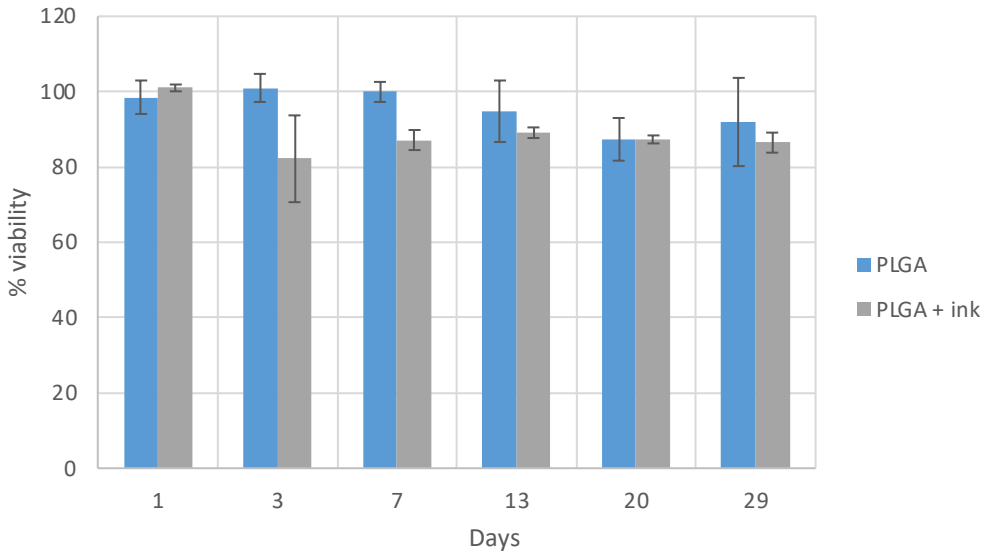

Figure S5. Viability of dermal fibroblasts when in contact for 30 days with PEDOT:HAS-PBA-PEGene cross-linked on PLGA and PLGA alone. The cell viability was assessed using MTT assay (n=3/condition).