Electronic Supplementary Material (ESI) for Nanoscale.

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**Supporting Information for**

# All-printed and Stretchable Organic Electrochemical Transistors Using Hydrogel Electrolyte

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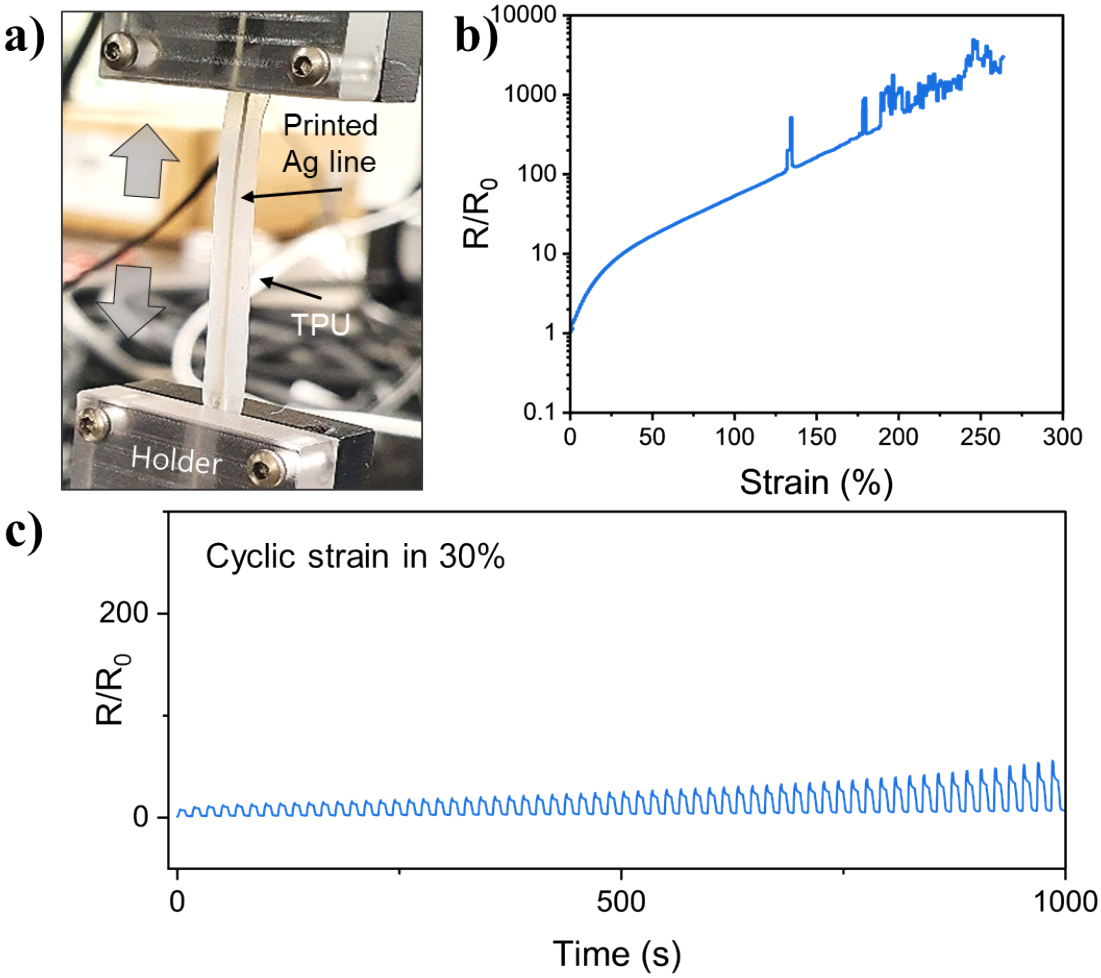


**Fig. S1** Electromechanical test of a printed stretchable Ag electrode. a) Digital photo of the sample. b) Normalized resistance (R) with respect to the initial resistance ($R_0$) at 0% while stretching until break. c) 30% cyclic tensile strain test. 10 mA was applied in b) and c)

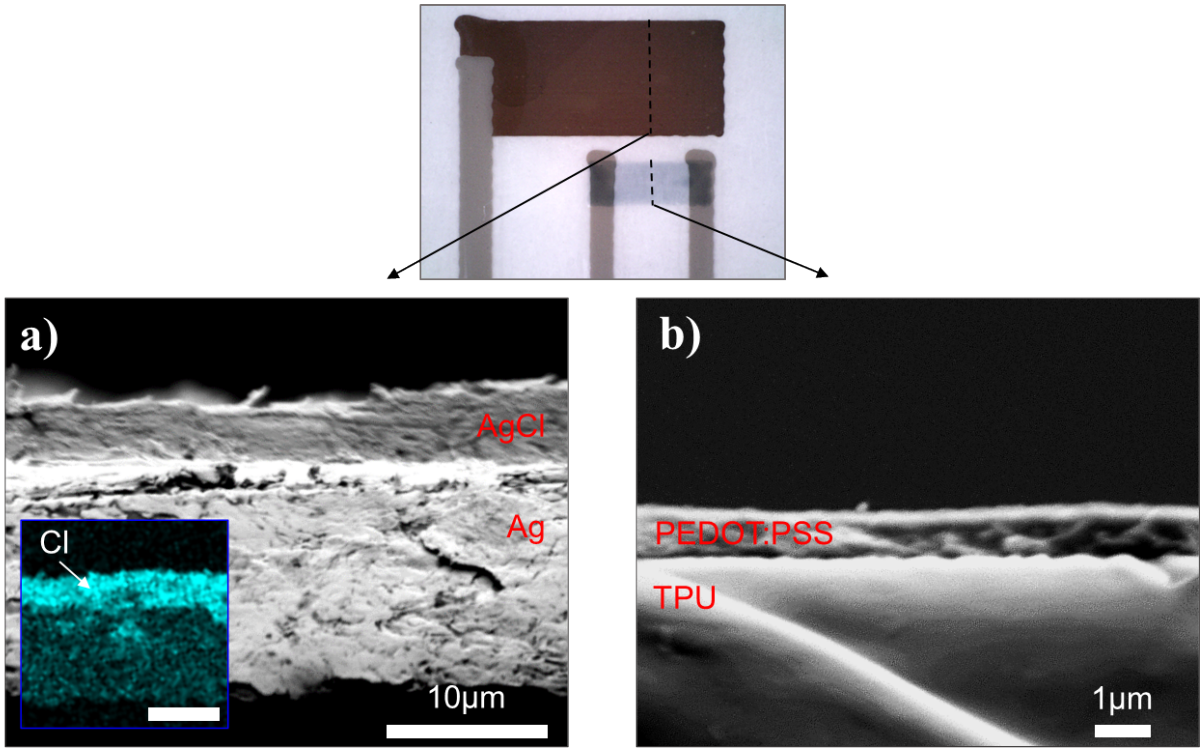


**Fig. S2** FE-SEM cross-sectional images a) printed Ag/AgCl gate. The inset shows Cl element in AgCl layer by Energy-dispersive X-ray spectroscopy (scale bar: 10µm). b) printed PEDOT:PSS channel on TPU substrate.

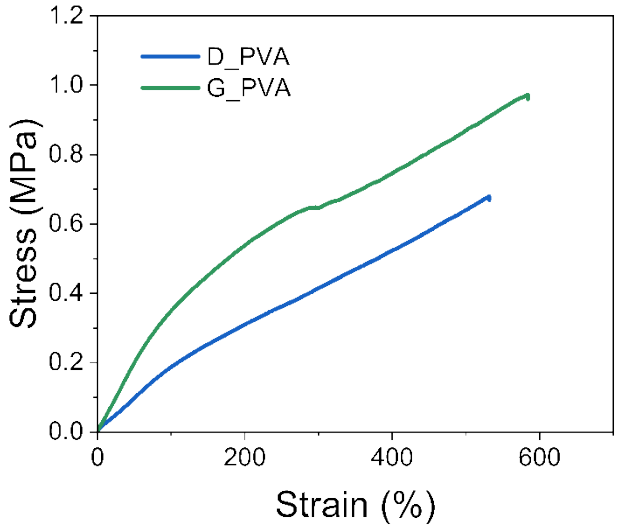


**Fig. S3** Stress-strain curve of hydrogel tensile test.

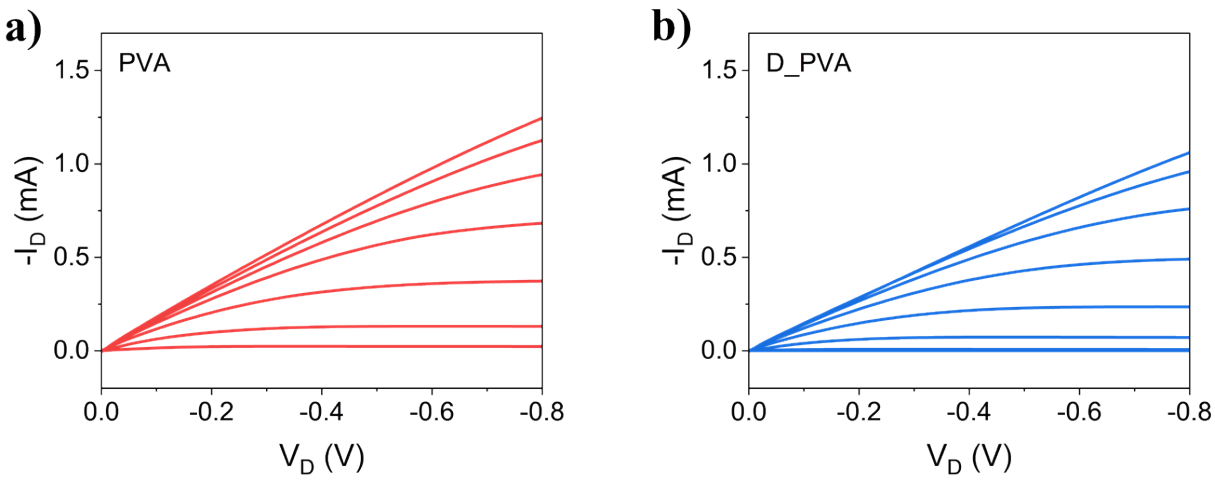


**Fig. S4** Output curves of a) PVA and b) D_PVA OECT. ($V_G$ from -0.6 to 0.8 V in 0.2 V steps)

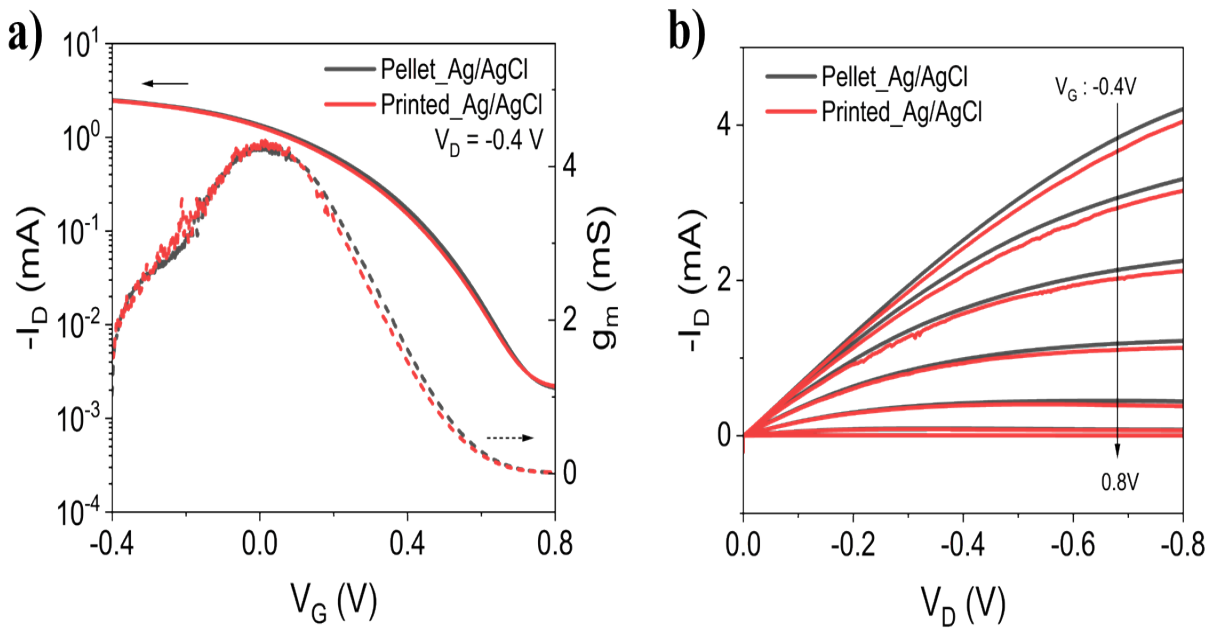


**Fig. S5** Comparison of I-V characteristics measured with a pellet and a printed Ag/AgCl gate a) transfer curves and b) output curves. The dimension of Ag/AgCl pellet (Warner Instruments) is 4mm diameter and 1mm thickness. The electrolyte is a 0.1 M NaCl solution.

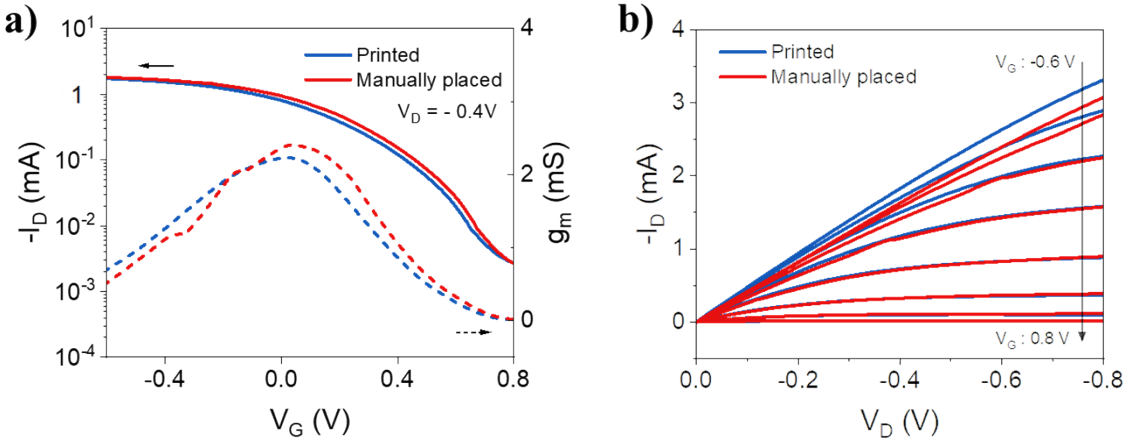


**Fig. S6** Comparison of I-V characteristics measured with printed and manually attached PVA hydrogel electrolytes on the OECTs a) transfer curves and b) output curves.

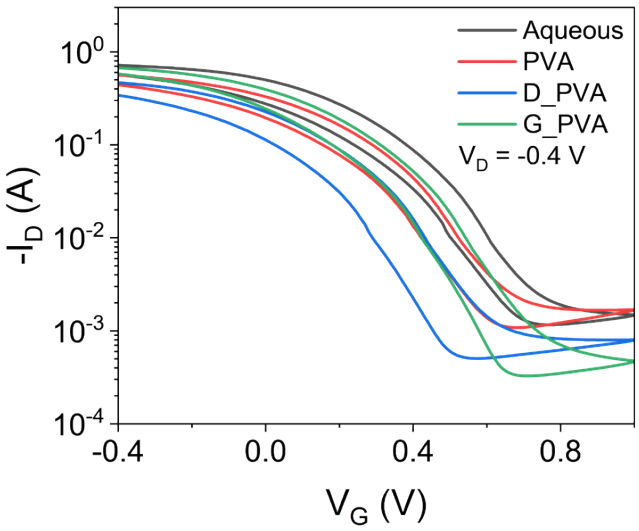


**Fig. S7** Transfer curves with 4 types of electrolytes, including backward sweep of gate voltage

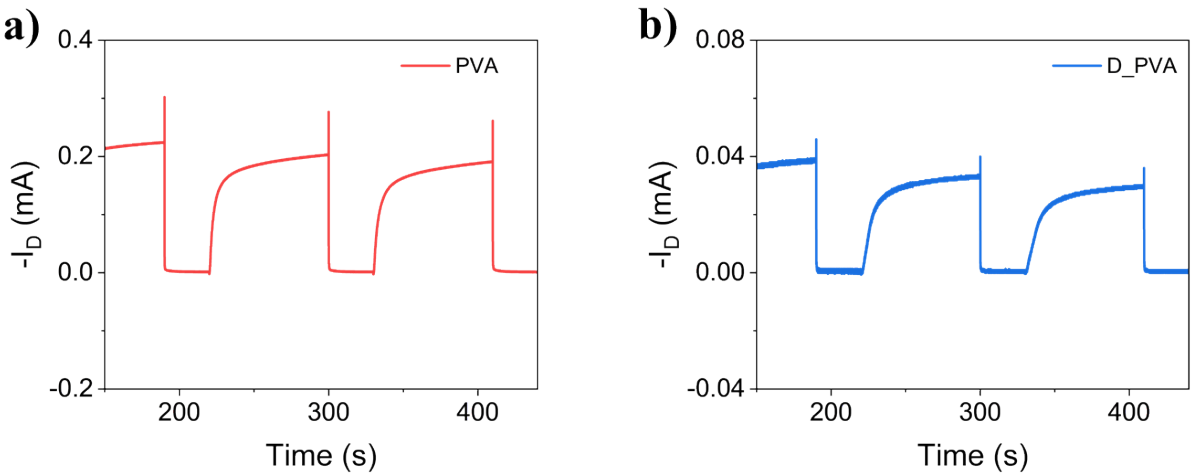


**Fig. S8** Transient responses of a) PVA a) and b) D_PVA OECTs. ($V_D$ = -0.4 V and $\Delta V_G$ = 0.7 V)

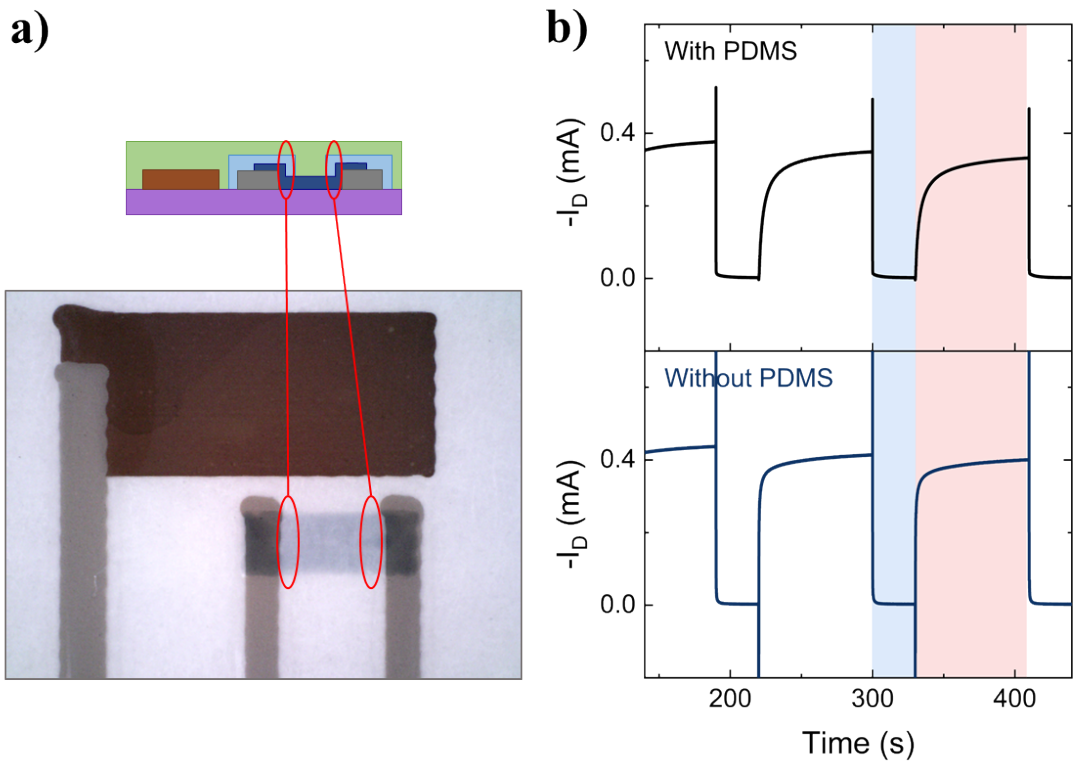


**Fig. S9** a) A scheme and a microscopic image of the OECT, indicating PDMS covering the PEDOT:PSS layer. b) Comparison of transient responses between the aqueous electrolyte-gated OECT with and without PDMS cover. The blue and red area indicate on-to-off and off-to-on responses, respectively. $V_D$ = -0.4 V and 0.7 V gate pulses were applied.

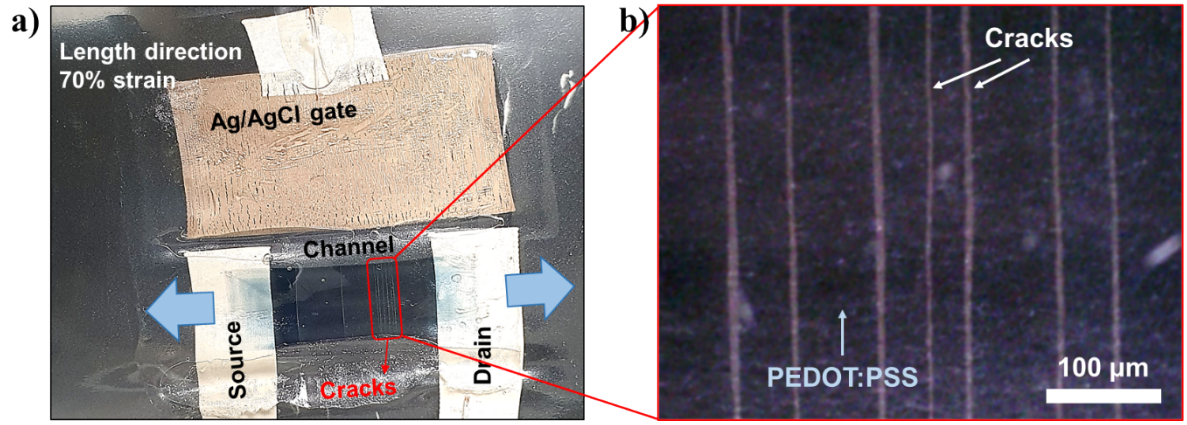


**Fig. S10** a) A digital photo of a stretched OECT in length direction at 70%. b) A microscopic image of micro-cracks on PEDOT:PSS channel.

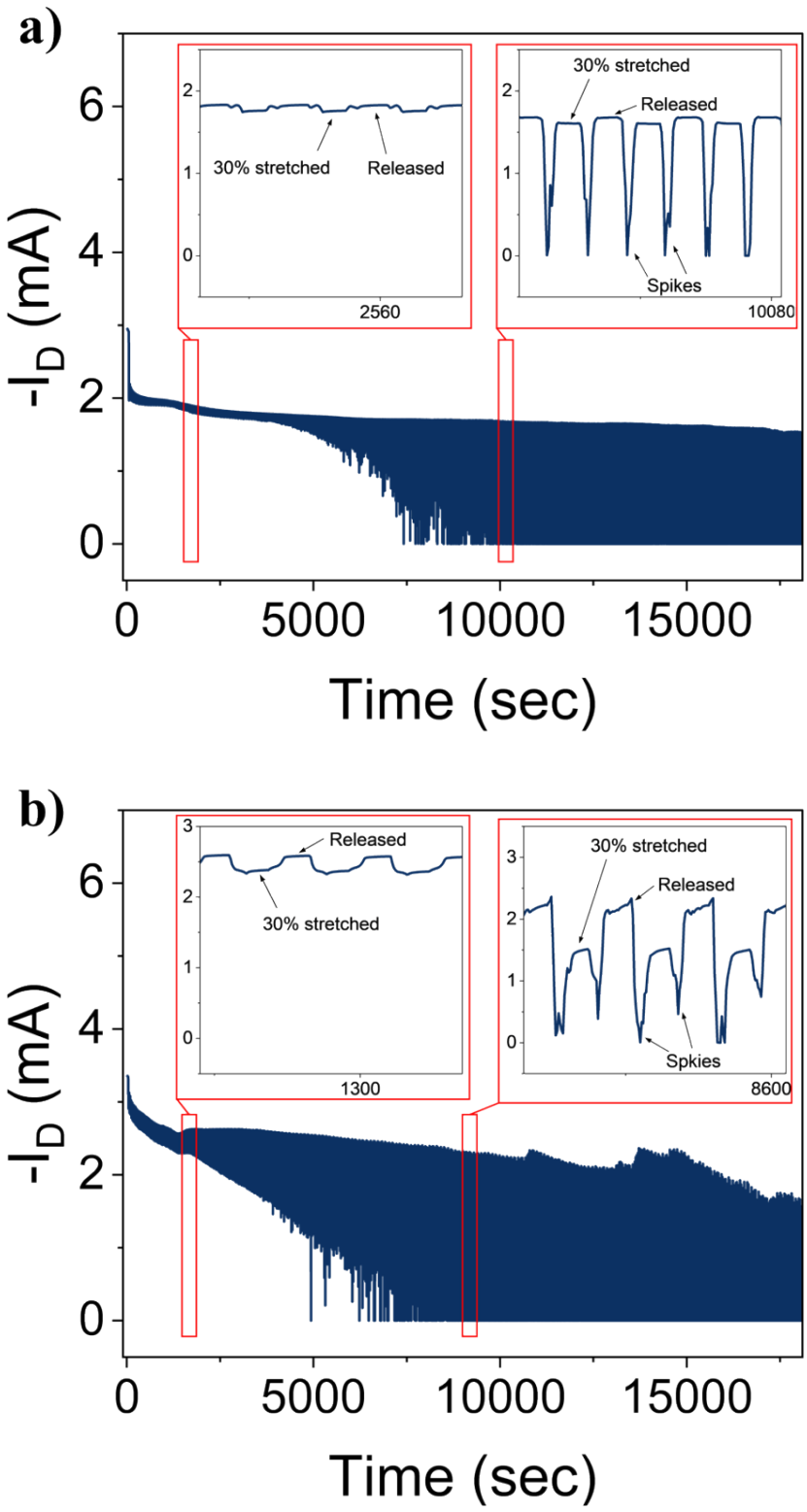


**Fig. S11** The drain current measured under 30% cyclic strains in a) the length direction and b) the width direction. The device was biased at $V_D$ = -0.4 V and $V_G$ = 0 V. The insets are magnified plots.