Supplementary Information

A simple all-PEDOT:PSS electrochemical transistor for ascorbic acid sensing

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Chemicals and materials

CLEVIOS™ PH 1000 suspension (PEDOT:PSS) was purchased by Heraeus. Ascorbic Acid, (3-Glycidyloxypropyl)trimethoxysilane, sodium dodecylbenzenesulfonate and potassium hydroxide were purchased by Sigma Aldrich. Potassium phosphate monobasic was bought by Fluka. Ethylene Glycol was obtained by Carlo Erba. All chemicals were reagent grade or higher. The phosphate buffer solution (PBS) was made up by 0.1 M KH_2PO_4 and corrected to pH 5.5 with 1 M KOH. The glass slides were obtained by Menzel-Gläser.

OECT fabrication

Ethyleneglycol 20 v/v %, dodecylbenzene sulfonic acid 0.05 v/v % and 3-glycidyloxypropyltrimethoxysilane1 v/v % were added to a CLEVIOS™PH 1000 suspension (PEDOT:PSS). The solution was filtered through a 1.2 μm cellulose acetate filter onto a glass slide used as substrate, which was previously covered by using insulating tape as a mask, and spin coated at 500 rpm for 3 s or at 3000 rpm for 10 s in order to obtain polymeric films with different thickness. The film was pre-baked at 60 °C for 5 minutes, and then annealed at 140 °C for 30 minutes after removing the insulating tape. The OECT scheme is reported in Figure 1 A; the external PEDOT:PSS stripe was used as the source-drain channel while the inner one worked as the gate electrode.

AFM characterization

The thickness of the PEDOT:PSS thin films used as electrodes in the OECTs was measured with a Park NX10 atomic force microscope (AFM). The polymer was gently scratched from the glass substrate using a scalpel and a topographic image of the generated height step was subsequently acquired and analyzed by means of a software for AFM image analysis (Gwyddion). The images were obtained in non-contact mode using a scan-size of 40 × 40 μm^2. Fig. 1 D shows a typical image of PEDOT:PSS surface.

Figure SI

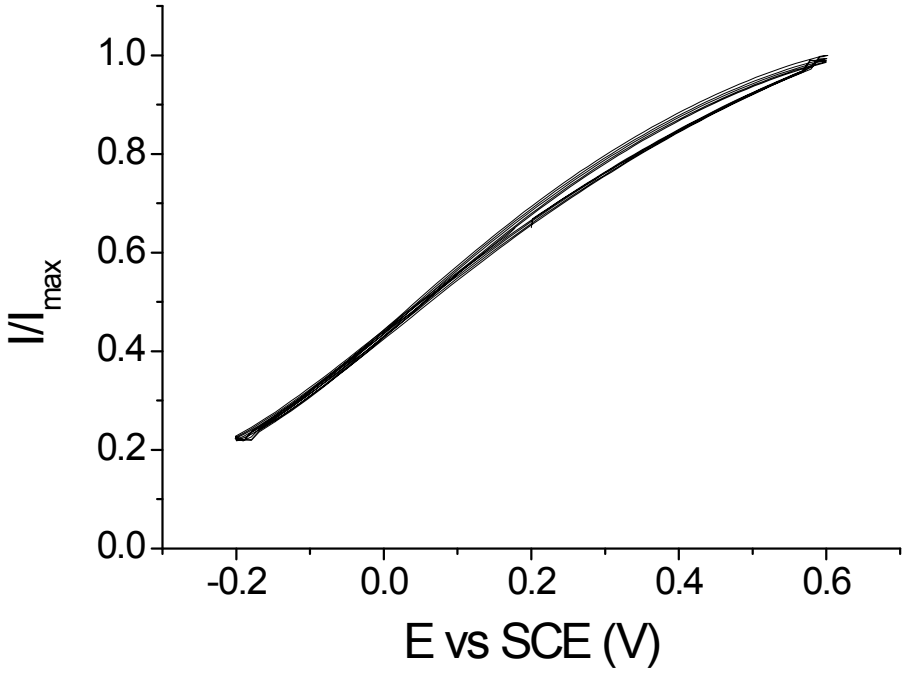


Fig.1 SI. I_d/I_{max} *vs* E curve obtained by connecting the potentiostat to the source.

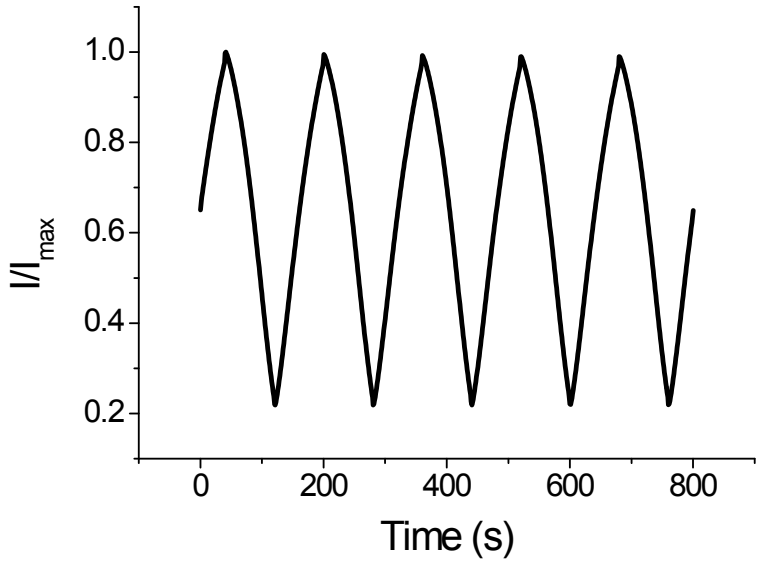
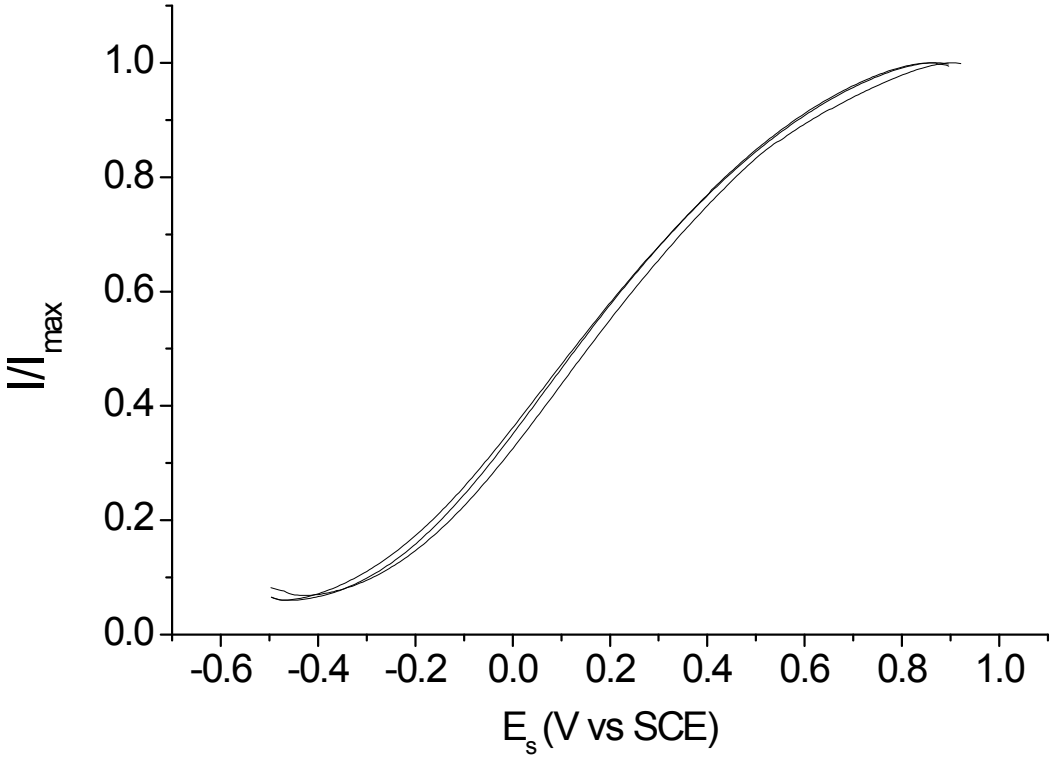


Fig.2 SI. I_d/I_{max} *vs* time curve obtained by connecting the potentiostat to the source.

Fig.3 SI. I_d/I_{max} *vs* E_s curves obtained for 3 different devices.



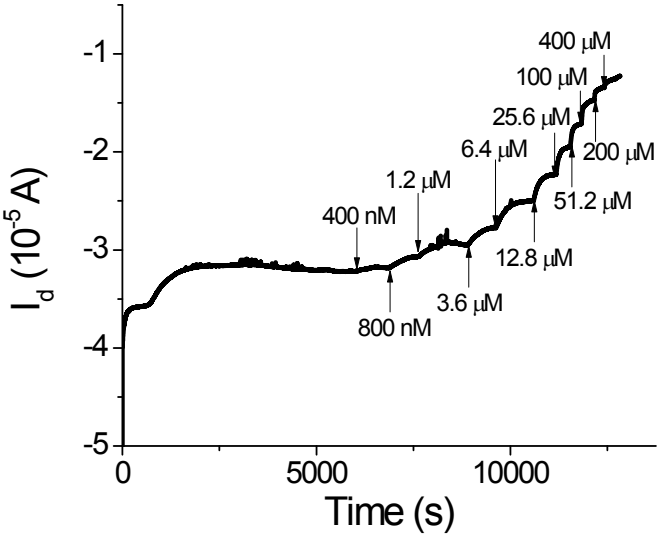


Fig. 4 SI. I_{drain} *vs* time curve obtained by addingdifferent AA amounts to PBS 0.1 M.

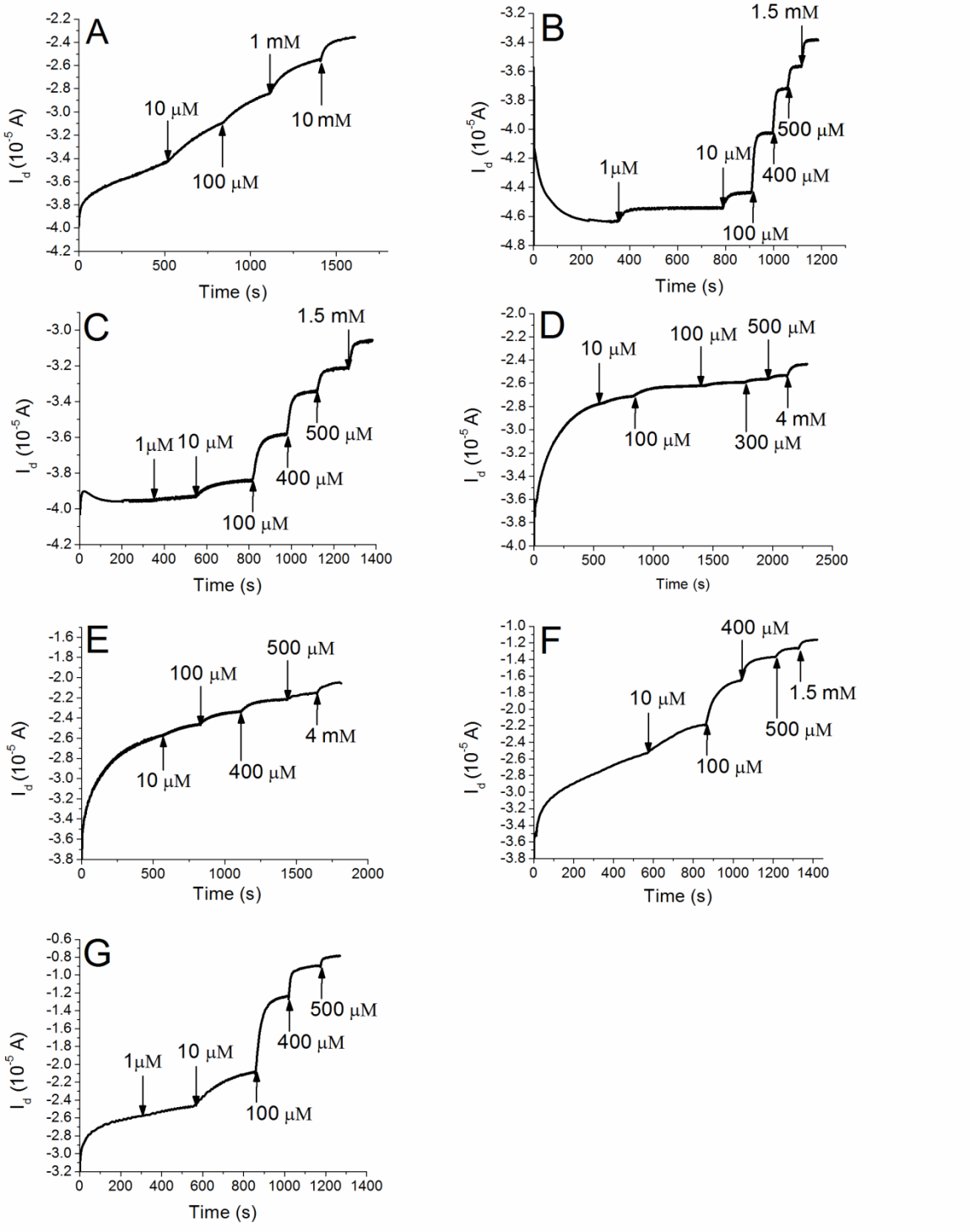


Fig. 5. SI. I_{drain}*vs* time curves obtained for different V_g(A:without applied V_g; B: V_g = -0.9 V; C: V_g = -0.6 V; D: V_g = -0.3 V; E: V_g = 0 V; F: V_g = +0.25 V; G: V_g = +0.5 V) by adding AA to the electrolyte solution (the concentration increments in the electrolyte solution due to AA additions are reported on the arrows that label them).

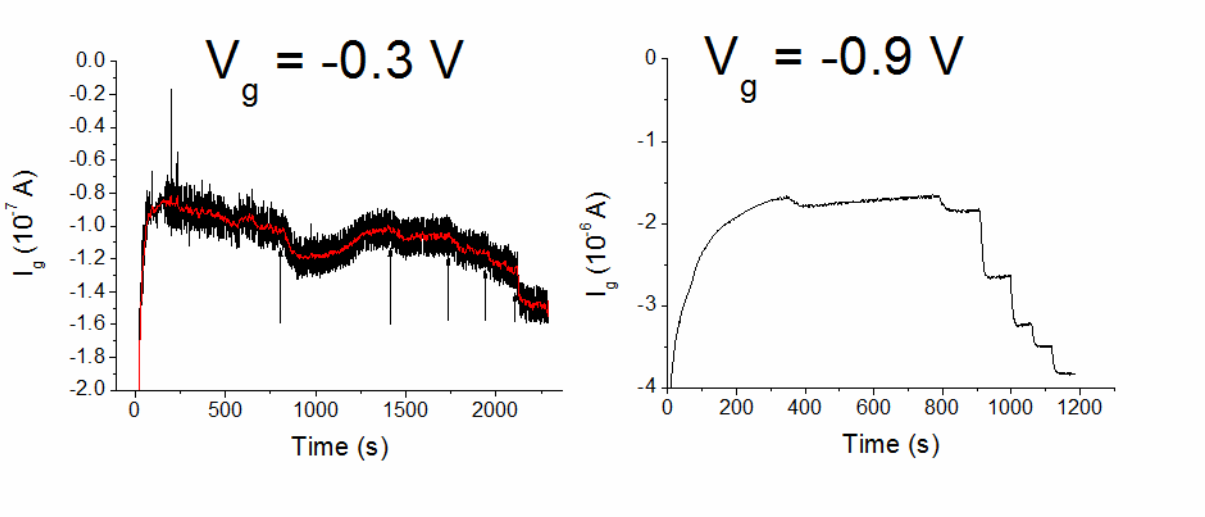


Fig. 6 SI. I_g *vs* time recorded at different V_g (-0.3 and -0.9 V) while different amounts of AA were added to the electrolyte solution under stirring.