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Supplement of

In situ casting of polyvinyl chloride membranes in agar-bridged extended-gate field effect transistor sensors

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Supplementary section

S1: Repeatability, response time, and stability

To confirm the repeatability of our devices, we have prepared a second sensor that is nominally identical to the bridged EGFET used for Fig. 3 (agar bridge, PVC membrane, QR sensitiser). We record the calibration chart shown as Fig. S1:

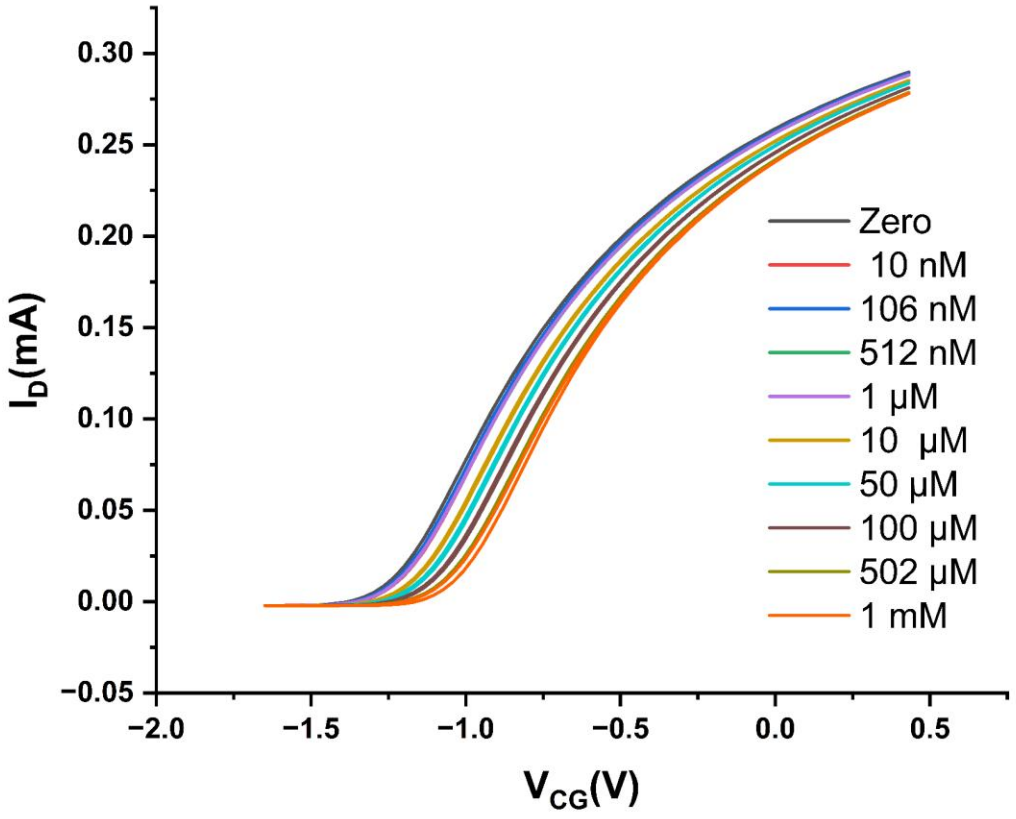

Figure S1: Repeat of the experiment shown in Fig. 3a with a different sensor that was prepared nominally identically to the device used for Fig. 3.

ΔV_{sat} for Fig. S1 extrapolates to 231 mV *vs*. 230 mV in the previous Fig. 3.

In Fig. S2, we confirm the fast response and long-term stability of bridged EGEFT response characteristics. We record transfer characteristics of an agar-bridged EGFET sensitised with QR in a PVC membrane, first under zero analyte, then immediately after adding 100 µM Cr(VI), then again 5 minutes later without additional analyte titration.

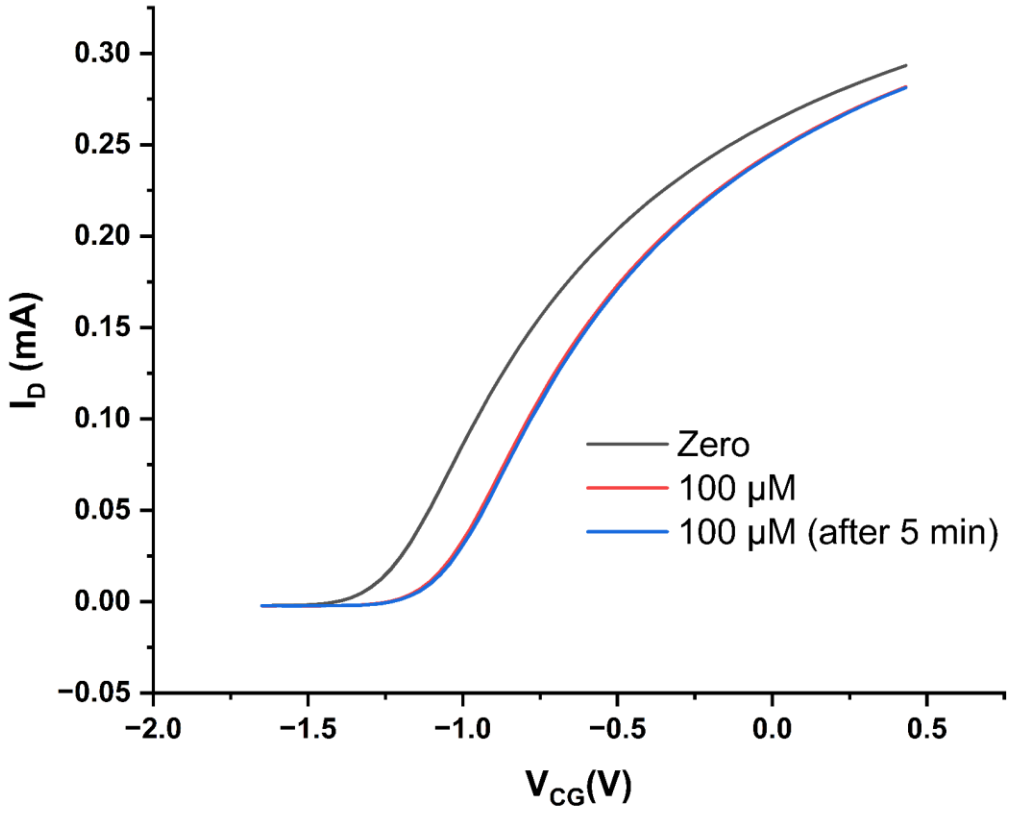

Figure S2: Transfer characteristics of an agar- bridged EGFET sensitised with QR in a PVC membrane under zero analyte (black), 100 µM Cr(VI) measured immediately after titrating Cr(VI) (red), and measured again 5 minutes later without titrating more analyte (blue).

We find a significant shift of the transfer after titrating 100 µM Cr(VI) into the CG pool when recording the transfer immediately after titration. When recording another transfer 5 minutes later without further analyte addition, it is virtually identical to the transfer recorded immediately after titration. We note that a 5-minute stability window under electrical addressing and analyte titration was sufficient to carry out all calibrations and measurements reported here.

We conclude that the potentiometric response develops on a timescale shorter than the recording of a transfer, and then is stable and constant for at least as long as it takes to record a full calibration.

S2: Sensitiser phase separation/coagulation

Fig. S3 shows a dispersion of QR in an agar hydrogel membrane, prepared as described in section 2.2:

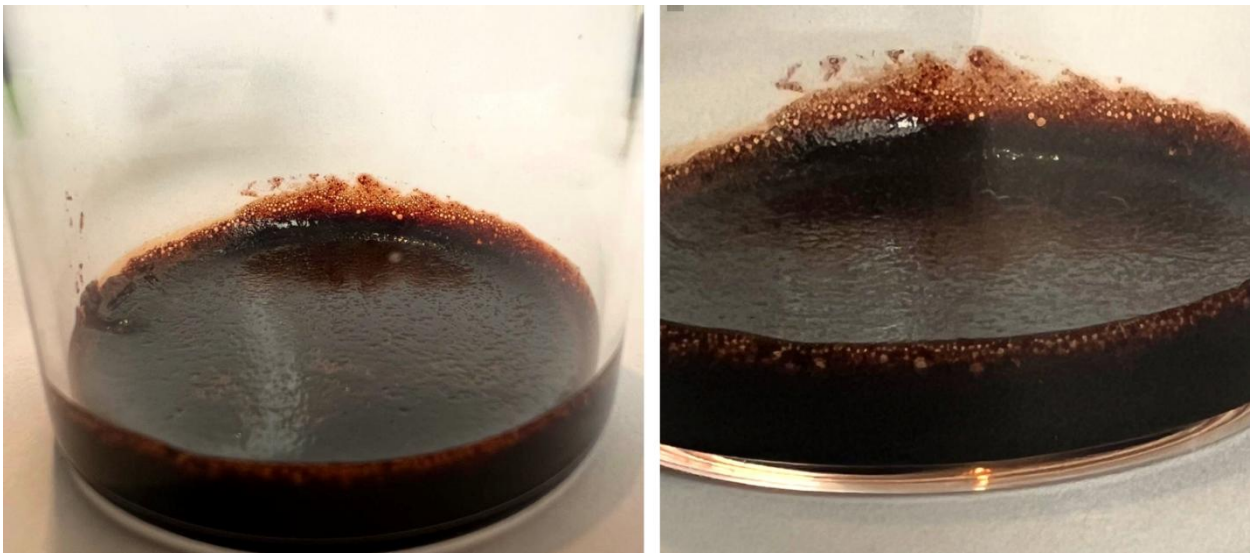

Figure S3: Dispersion of QR in agar hydrogel membrane.

QR is evenly dispersed in agar as a fine powder, but not dissolved: Light does not transmit at any wavelength due to multiple scattering. In a PVC membrane, where QR does dissolve in the processing solvent THF, light outside the QR absorption band (below 400 nm / above 600 nm) is transmitted.

Fig. S4 shows the coagulation of dispersed Bentonite powder at the bottom of plasticised PVC mixture:

Figure S4: Coagulation of Bentonite in plasticised PVC.