

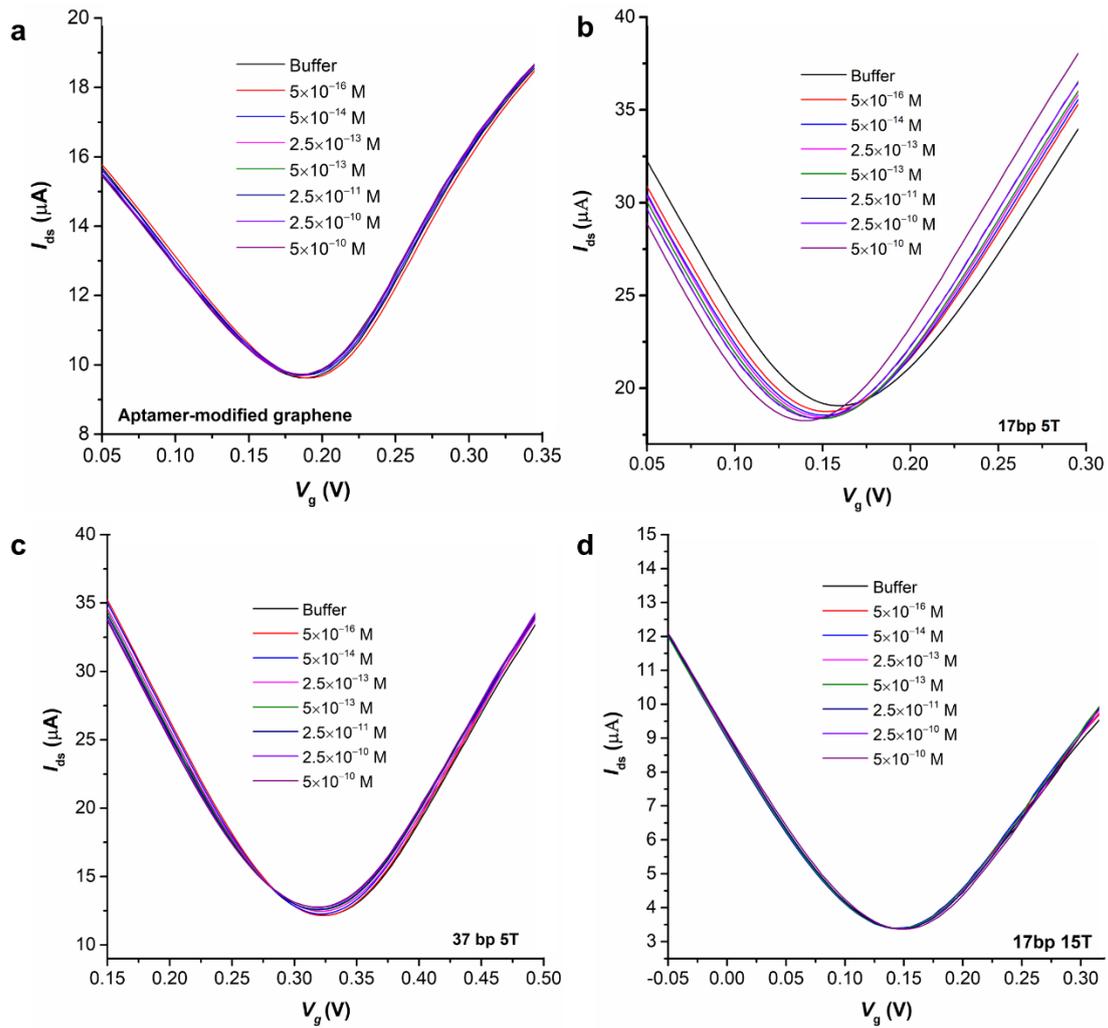
Supplementary information

Molecular-electromechanical system for unamplified detection of trace analytes in biofluids

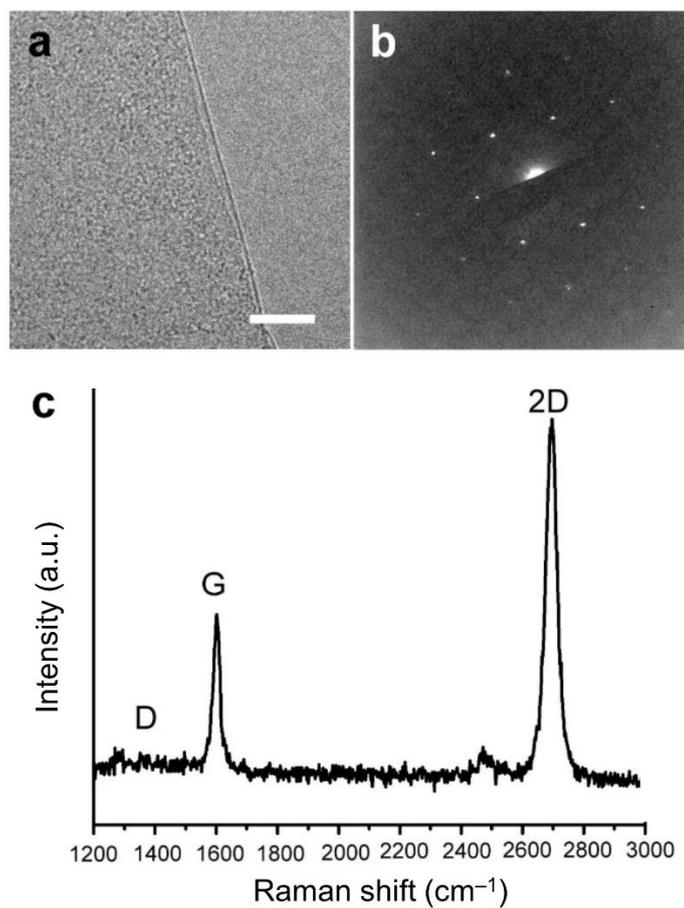
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Supplementary Table 1. Sequence of control ss-DNAs in ss-DNA-T testing including random ss-DNA R1-R3, ss-DNAs with one-base mismatches at 5' end (ss-DNA-miss-5'), middle position (ss-DNA-miss-m), and 3' end (ss-DNA-miss-3').

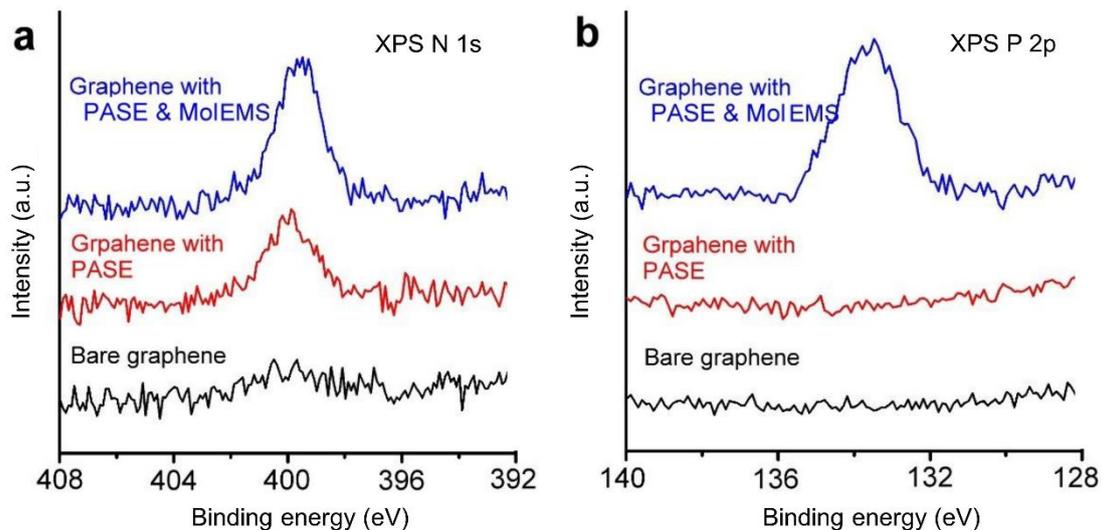
Name	Sequence (5'-3')
ss-DNA-T	CCGTCTGCGGTATGTGGAAAGGTTATGG
ss-DNA-R1	AACATCACTTGCCCTGAGTAGAAGAACT
ss-DNA-R2	TGTAGCAATACTTCTTTGATTAGTAAT
ss-DNA-R3	AGTCTGTCCATCACGCAAATTAACCGT
ss-DNA-miss-3'	CCGTCTGCGGTATGTGGAAAGGTTATGT
ss-DNA-miss-m	CCGTCTGCGGTATTTGGAAAGGTTATGG
ss-DNA-miss-5'	TCGTCTGCGGTATGTGGAAAGGTTATGG



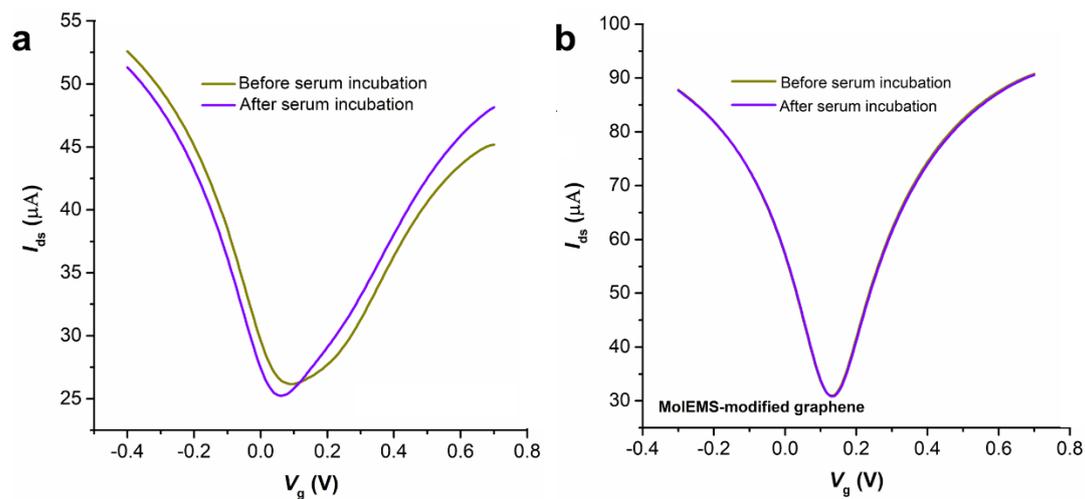
Supplementary Fig. 1: MoEMS structure optimization. I_{ds} - V_g curve upon addition of thrombin of g-FET functionalized with MoEMS of different structure dimensions: **a**, 5T **b**, 17bp-5T **c**, 37bp-5T **d**, 17bp-15T.



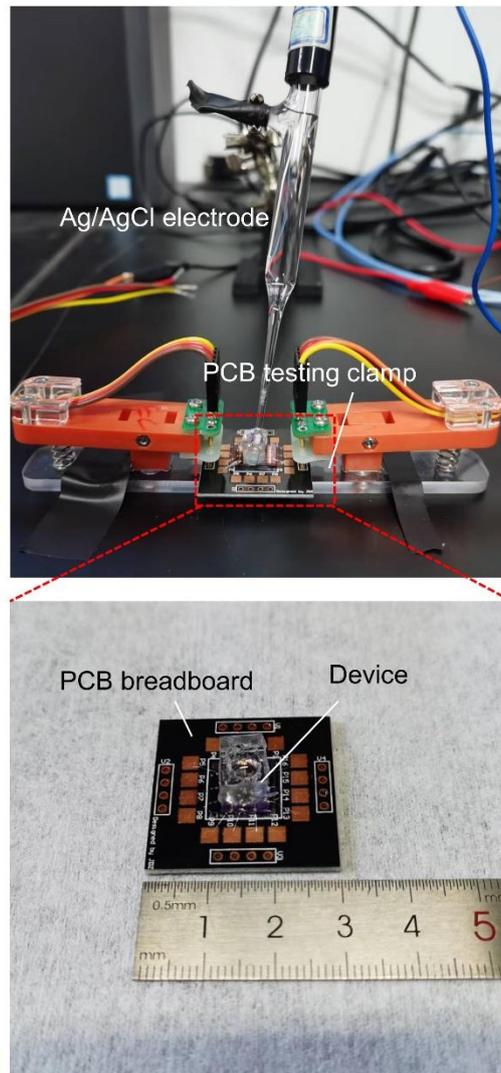
Supplementary Fig. 2: Graphene characterization. **a**, TEM image of graphene synthesized via chemical vapor deposition approach. **b**, electron diffraction pattern of the graphene. **c**, Raman spectrum of the graphene. These results suggest high-quality monolayer graphene. All the data are adapted from ref.⁴⁵.



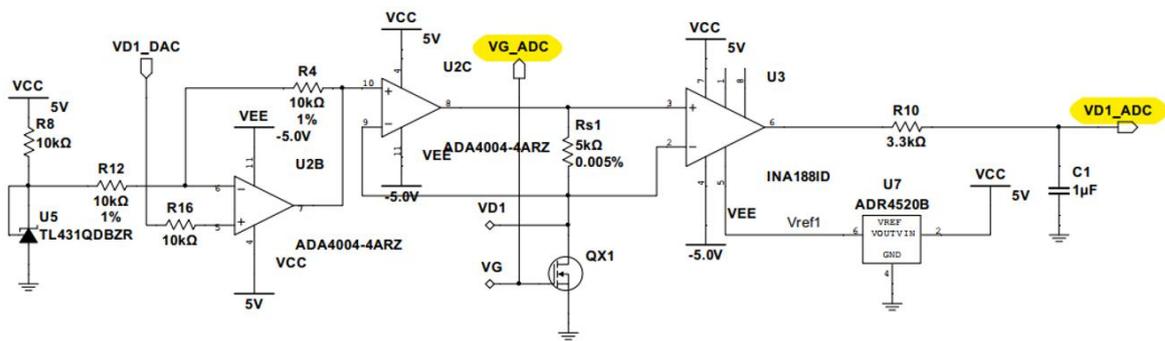
Supplementary Fig. 3: Characterization of MoEMS functionalization on graphene. **a**, XPS N 1s and **b**, XPS P 2p spectra of bare graphene (black), graphene after modifying with PASE (red) and graphene after immobilization of MoEMS on PASE (blue). The appearance of N 1s peak and P 2p peak indicates the successful immobilization of PASE and MoEMS, respectively. All the data are adapted from ref.⁴⁵.



Supplementary Fig. 4: Antifouling characterization of MoEMS-modified graphene. I_{ds} - V_g versus t curves are measured before and after 30-min incubation of full serum for **a**, bare graphene and **b**, MoEMS-modified graphene. Appreciable ΔV_{Dirac} is observed for bare graphene, while neglectable ΔV_{Dirac} is observed for MoEMS-modified graphene. All the data were adapted from ref.⁴⁵



Supplementary Fig. 5: Photo of experimental set-up for electrical measurement. The device is wire-bonded to a PCB-based breadboard that is connect to the semiconductor analyse through PCB testing clamp. An Ag/AgCl electrode is inserted into PDMS well.



Supplementary Figure 6. Circuit diagram of PCB board for portable testing system.