# Supplementary Data

## A Portable and Reusable Sensor System Based on Graphene for Real-Time and Sensitive Detection of Lead Ions in Water

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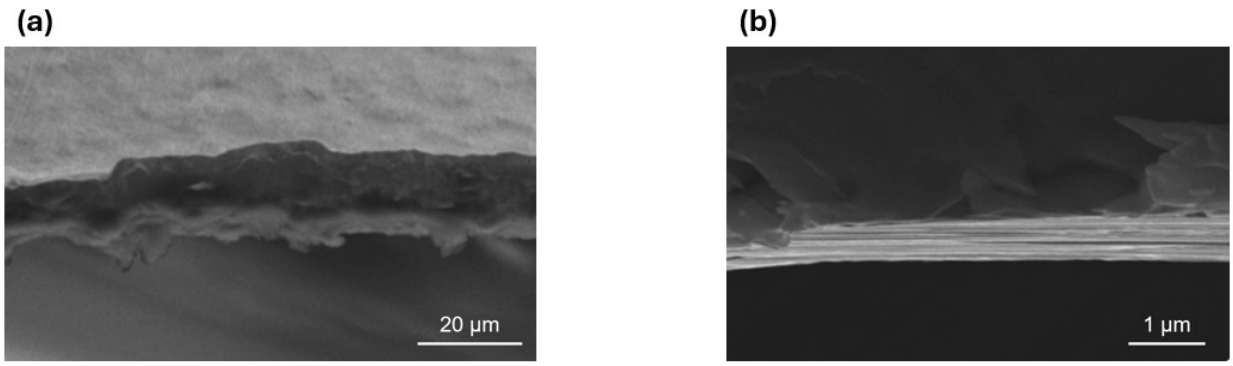


**Figure S1**. Cross-section SEM images of the full coverage films from (a) pristine graphene ink and (b) 3x diluted graphene ink.

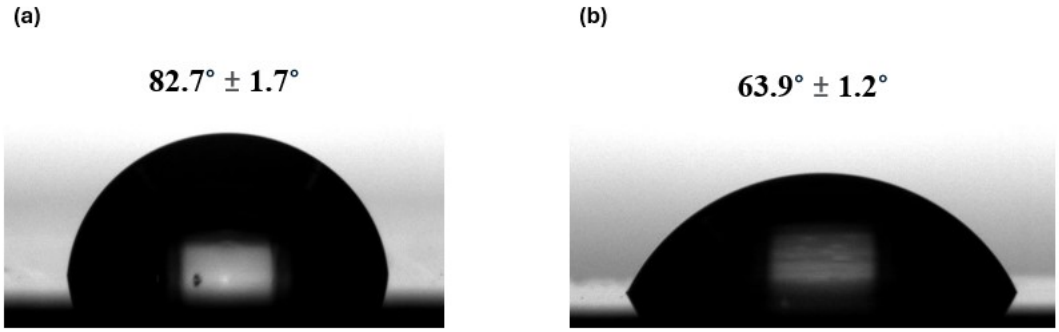


**Figure S2**. Contact angle measurements and analysis of (a) pristine graphene thin film and (b) PBA-functionalized graphene thin film.

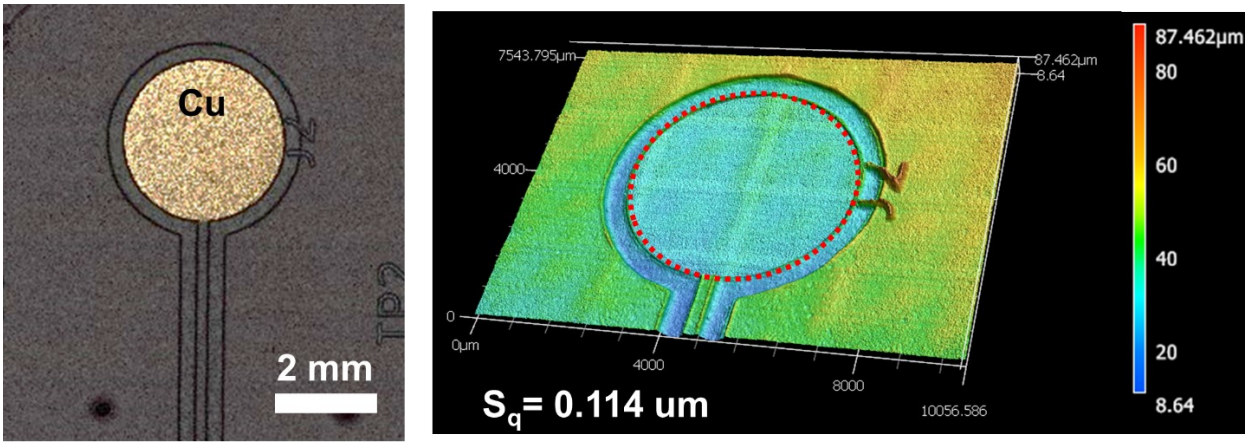


**Figure S3.** Confocal micrographs of a bare Cu pad on a sensor PCB showing the surface roughness ($S_q$) of 0.114 um. The surface roughness ($S_q$) of Si wafer is 0.022 um for comparison.

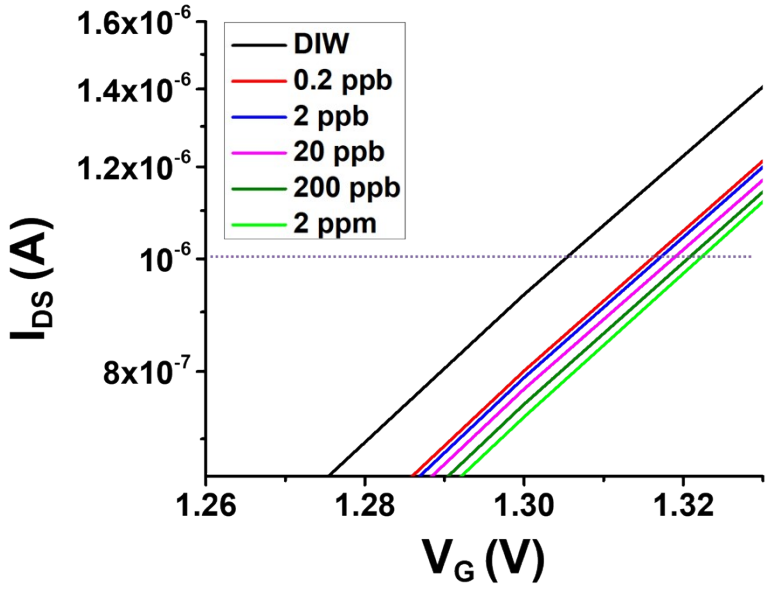


**Figure S4.** Transfer curves of the MOSFET upon detection of lead ions ranging from 0.2 ppb to 2 ppm using thick G-film sensor.

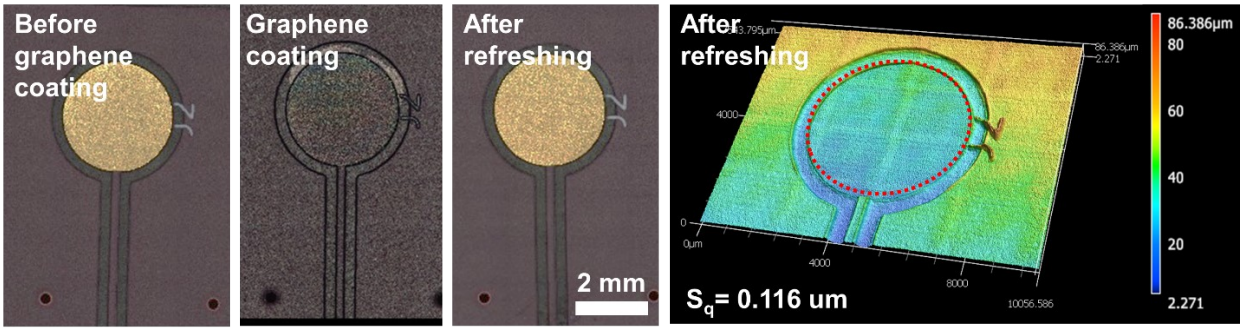


**Figure S5.** Confocal micrographs of a Cu pad from a sensor PCB before and after the refreshing process. The surface roughness ($S_q$) of the Cu pad after refreshing is 0.116 um, comparable to that of the original Cu pad.

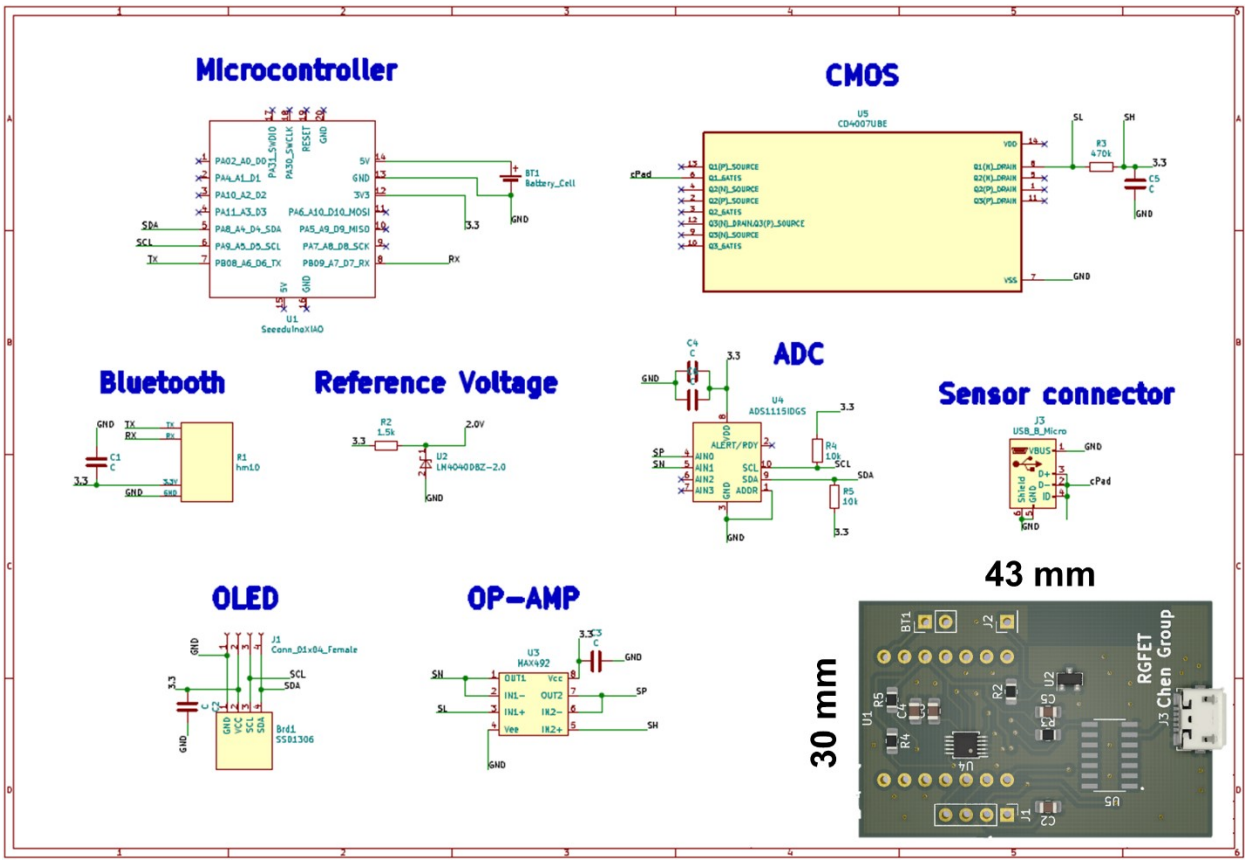


**Figure S6.** A circuit diagram of the portable sensor analyzer.

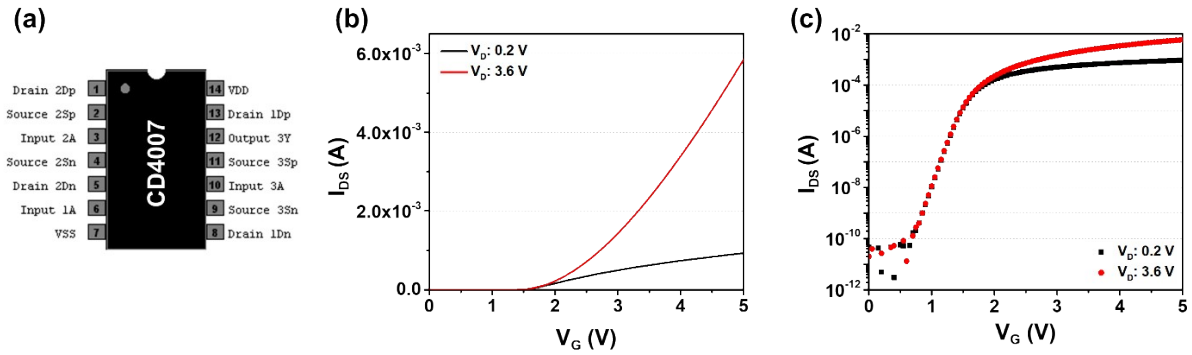


**Figure S7.** Characterization of a commercial n-type MOSFET. (a) A MOSFET (CD4007) used to construct the portable sensor system. (b) Transfer characteristic curves of the MOSFET as a function of gate and drain voltages. (c) Semi-logarithmic curves of those shown in (b).

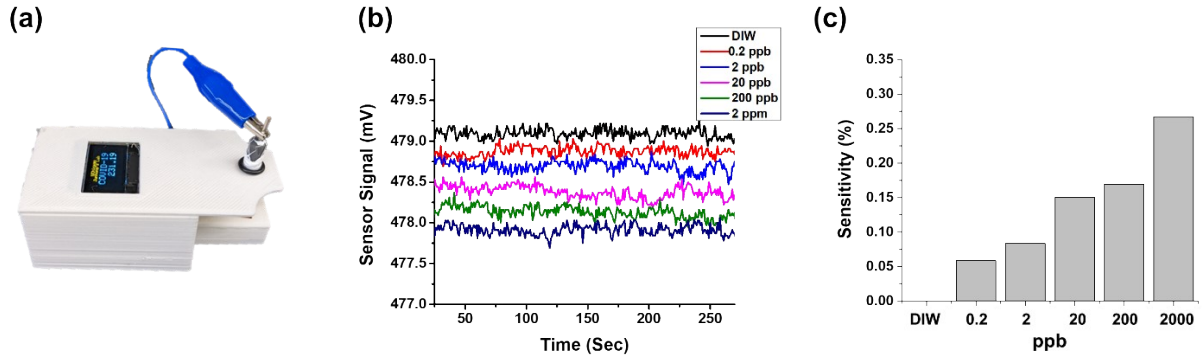


**Figure S8.** Lead ion detection using the portable sensor system. (a) The portable sensor with a sensor PCB bearing a thick G-film. (b) A real-time detection with respect to lead ion concentrations. (c) Sensitivity of the portable sensor toward lead ions using the thick G-film.