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Supplementary Materials

Chemical and Temperature Sensors Based on Functionalized Reduced Graphene Oxide

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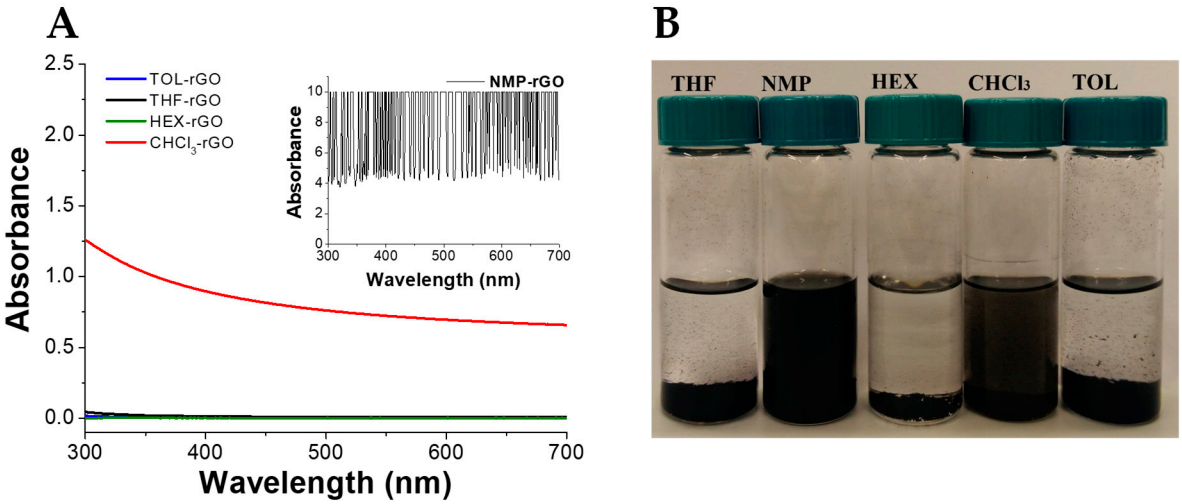

Figure S1. (**A**) UV-Vis spectra and (**B**) optical pictures of rGO dispersed in organic solvent after one month. Tetrahydrofuran (THF), 1-methyl-2-pyrrolidone (NMP), hexane (HEX), chloroform ($CHCl_3$), and toluene (TOL).

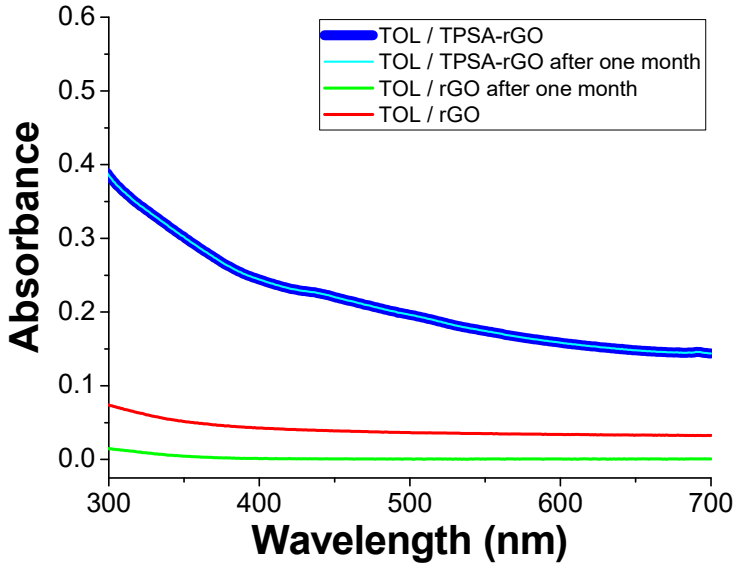

Figure S2. UV-Vis spectra of TPSA-rGO and rGO dispersed in toluene (TOL) after preparation and after one month.

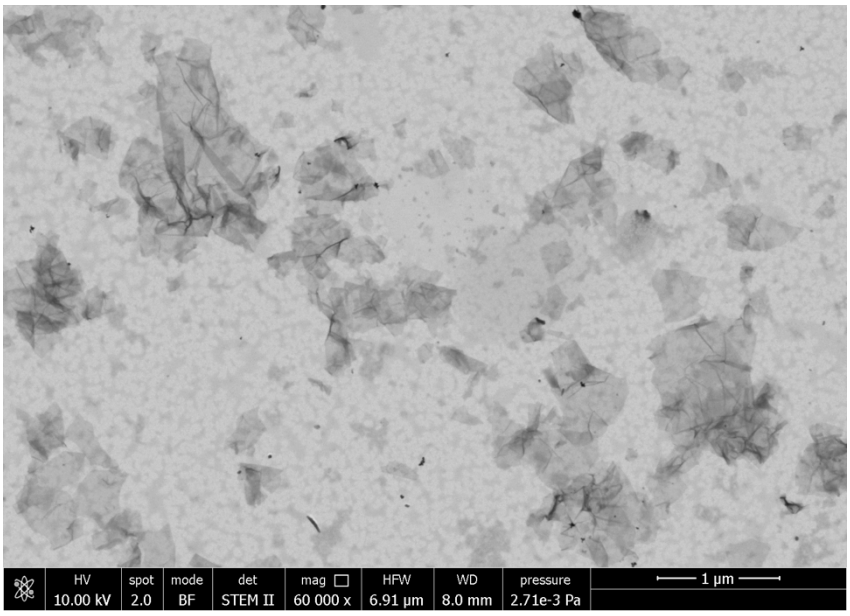

Figure S3. Scanning transmission electron microscopy (STEM) micrographs of TPSA-rGO dispersed in chloroform.

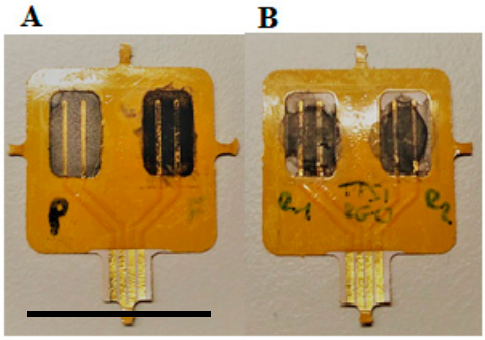

Figure S4. Temperature device electrodes. Scale bar = 2 cm. Plastic supports (Cad Line, Pisa, Italy) consisting of a polyimide film (Kapton®, thickness 50 mm) and suitable electrodes. Copper tracks were prepared by photolithography and then electroplated with Ni and Au (size: length 7 mm, width 1 mm, distance 2 mm; thickness of Cu 35 mm, Ni 3.0 mm, Au 1.2 mm). Sensor calibration was accomplished by using a temperature controlled hot stage (±0.1 °C) and measuring the electrical resistance with a digital multimeter (KEITHLEY Mod. 2700).

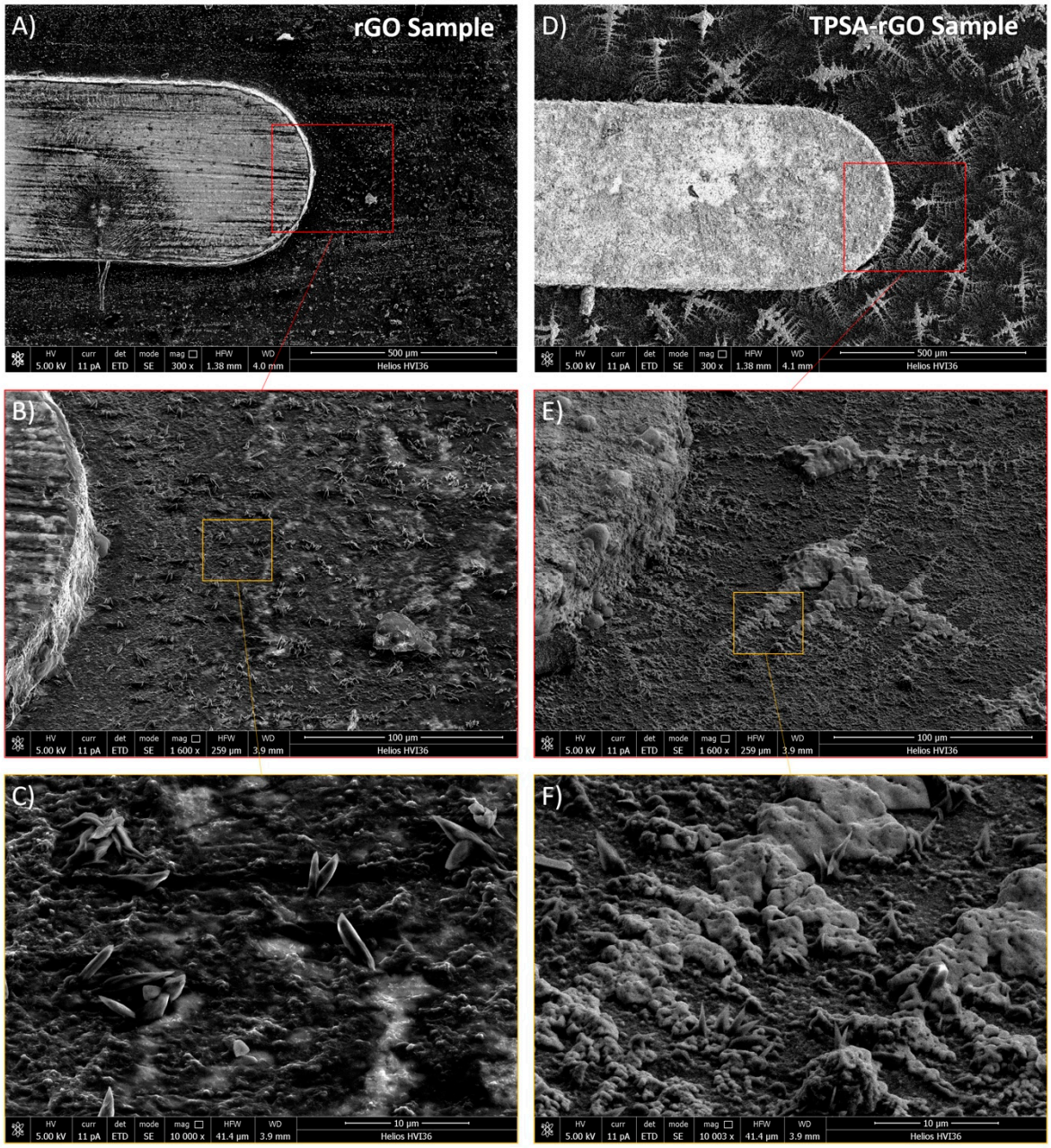

Figure S5. SEM images of temperature device electrodes coated with TPSA-rGO (**A–C**) and rGO (**D–E**) at different magnifications (images **B–F** are acquired with 52° tilted sample). It is evident a different morphology of the coating for the different samples, due to different dispersion of the rGO and TPSA-rGO in casting solution and they relative amount.

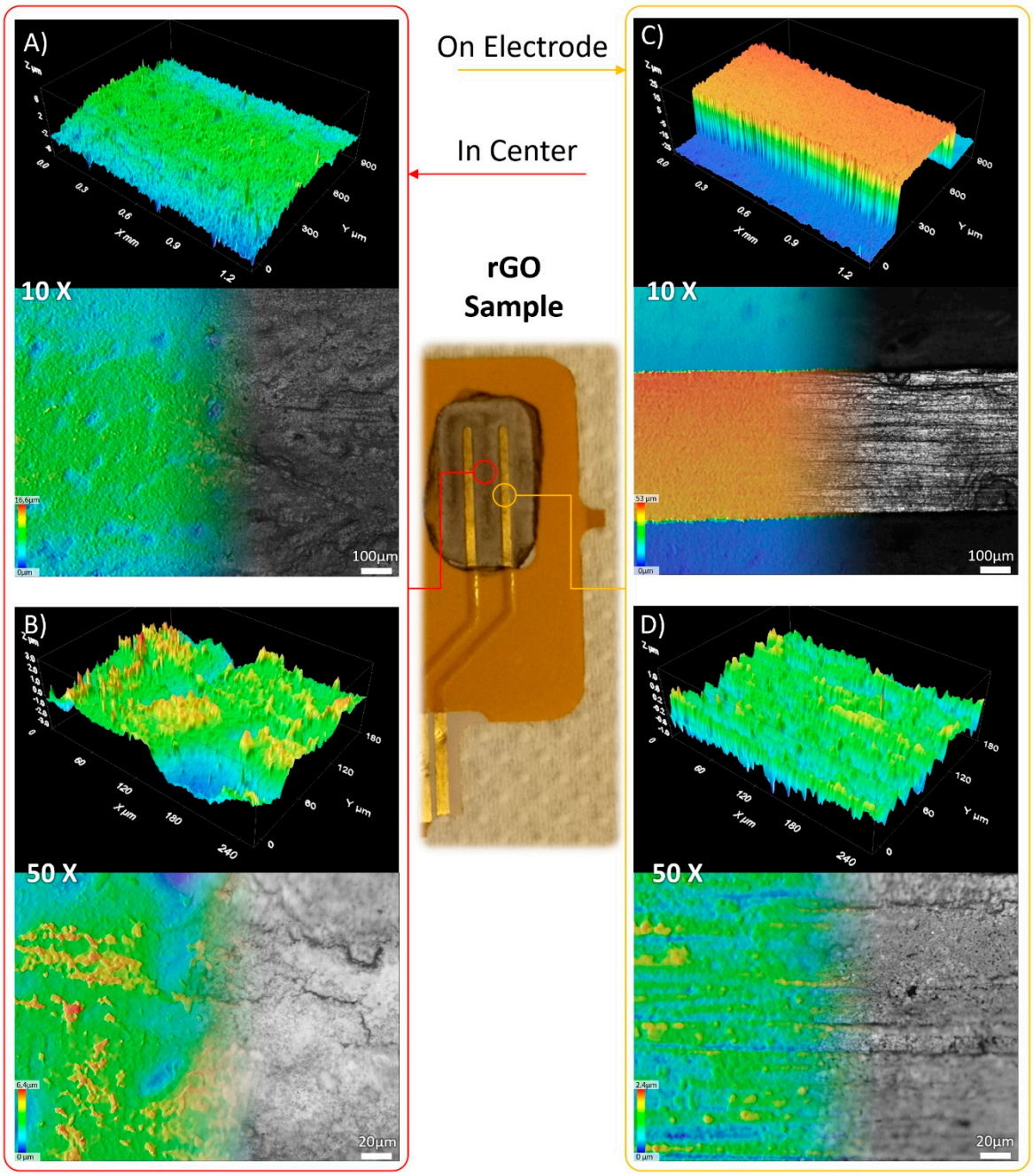

Figure S6. Optical and confocal profilometry of temperature device coated with rGO at different locations and at different magnifications. Panels **A**) and **B**) report measures done at the center of the device, while panels C) and D) refer to the measures done on top of one electrode. Panels **A**) and **C**) are acquired at 10X optical magnification, while **B**) and **D**) at 50X. Each panel report 3D confocal profilometry (top) and a merged optical/confocal 2D profilometry image (bottom).

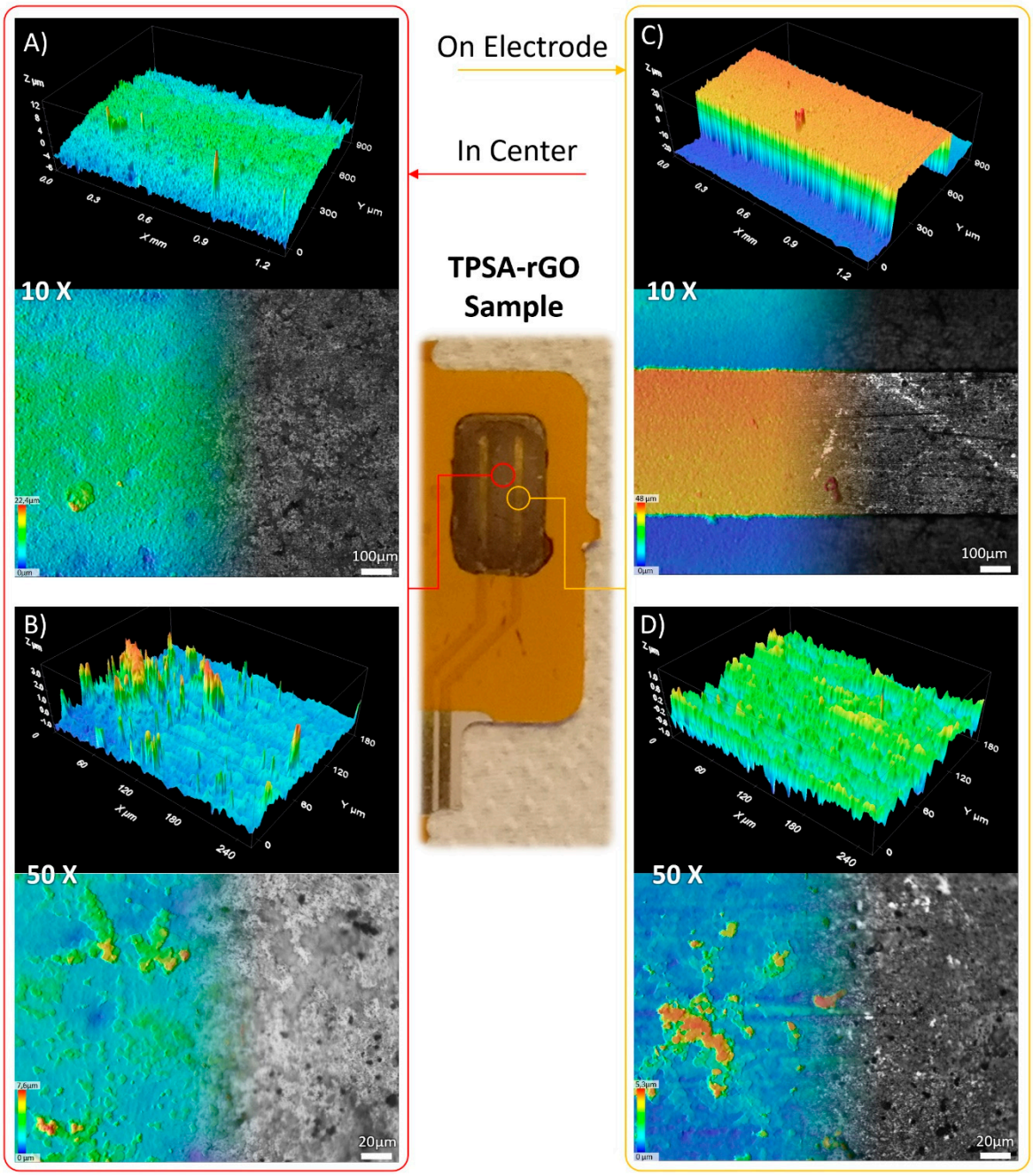

Figure S7. Optical and confocal profilometry of temperature device coated with TPSA-rGO at different locations and at different magnifications. Panels **A**) and **B**) report measures done at the center of the device, while panels **C**) and **D**) refer to the measures done on top of one electrode. Panels **A**) and **C**) are acquired at 10X optical magnification, while **B**) and **D**) at 50X. Each panel report 3D confocal profilometry (top) and a merged optical/confocal 2D profilometry image (bottom).

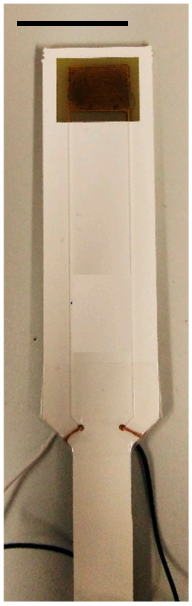

Figure S8. Organic solvent vapors device. Scale bar = 2 cm. The electrodes were fabricated onto FR-4 that is a composite material composed of woven fiberglass cloth with an epoxy resin binder substrate (thickness of 2 mm). Copper tracks were obtained by photolithography and electroplated with nickel and gold to fabricate the electrodes (thickness of copper 35 μm, nickel 3.0 μm, and gold 1.2 μm). In each case, the dispersion was left evaporate under fume hood and then dried under vacuum in a Schlenk tube for 4 hours. This step was repeated between each test to ensure complete solvent removal. The solid dispersions were connected to a digital multimeter (KEITHLEY 2010) and the measured resistances were obtained as a mean from one hundred measures as allowed by the multimeter settings.

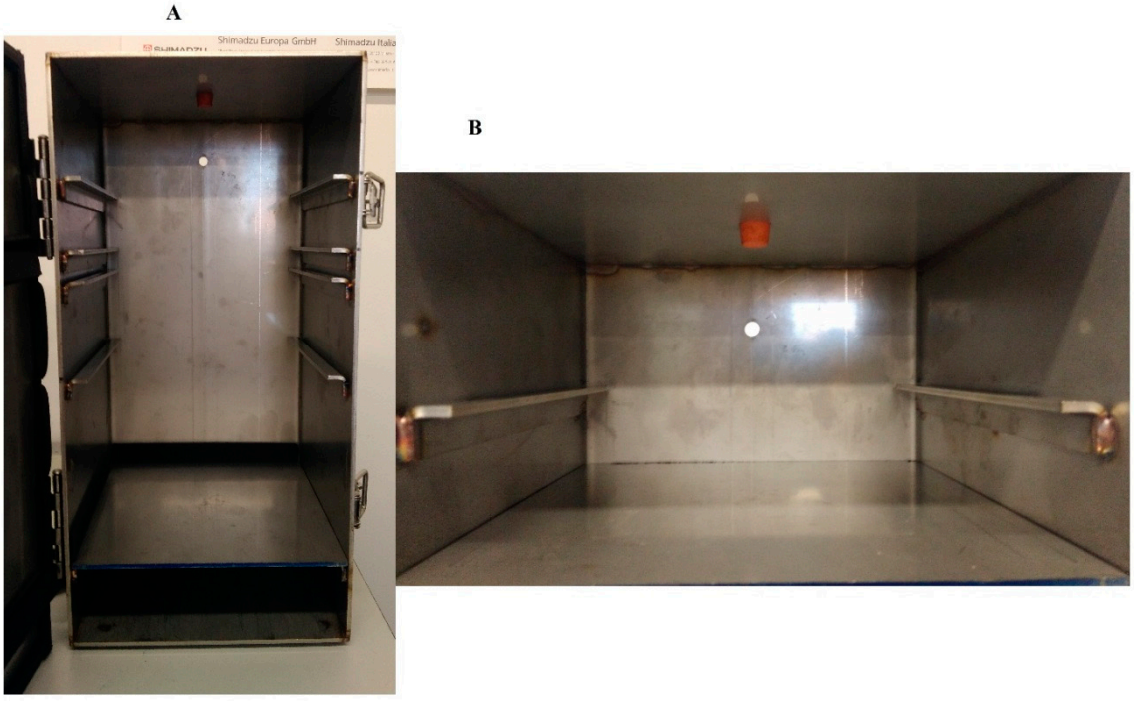

Figure S9. Organic solvent vapors chamber. Sealing of the chambers was allowed by rubber stripes glued to the movable door. Two small holes on backside and top of the chamber permit the connection

wires to pass through the wall (backside) and the solvent to be dropped inside (top). The device bearing the dispersion was stuck to the inside back wall, with the circuit exposed to the interior space. The room volume was set to 4.6 L in all measures. For each deposition three solvent has been tested: THF, $CHCl_3$ and Hexane. To account for the sensitivity of the devices, dispersions were exposed to an increasing amount of solvent. Around 23 μL of solvent (equal to 5 ppm to the chamber volume) was dropped from the top hole using a Gilson pipette and quickly the hole was closed with a rubber septum. Resistance values were taken every minute for a total of twenty and afterwards a new addition of 5 ppm was done until 100 ppm was reached. A control measure was performed, prior to every experiment, by measuring the resistance without the presence of solvent. In a first sets of experiments, the desired amount, usually 200 mL, was put in a beaker and placed inside the closed chamber to test the response over time in a saturated environment.

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