# Supporting Information

## Effectively enhanced vapor phase hybridized conductive polymer based on graphene oxide and glycerol influence additive for strain sensor application

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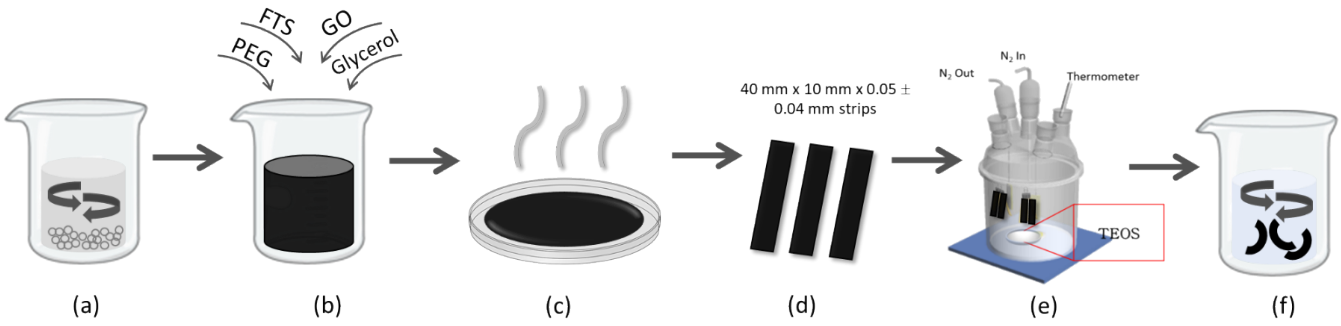


**Figure S1**. Schematic diagram of the fabrication of the graphene oxide-glycerol strain sensor (a) dissolving of TPU pellets in DMAc solution (b) addition of PEG, FTS, glycerol and graphene oxide (c) evaporating of solvent in an oven for 48 hrs (d) cutting film into strips (e) VPP (f) washing with ethanol then dried

**Table S1**. XRD data for TPU-GPS and 1% & 3% glycerol plasticized strain sensors

| SAMPLE | 2(θ) | d(Å) |
|---|---|---|
| TPU-GPS | 20.70 | 2.17 |
| TPU-GPS-1GLY | 20.86 | 2.15 |
| TPU-GPS-3GLY | 21.08 | 2.13 |

**Table S2**. Numerical data of the mechanical properties of the graphene oxide-based strain sensor

| SAMPLE | STRAIN AT MAXIMUM (%) | | | | MAX STRESS (MPa) | | | | Modulus | | | | Yield Stress (MPa) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Trial 1 | Trial 2 | Average | Standard Deviation | Trial 1 | Trial 2 | Average | Standard Deviation | Trial 1 | Trial 2 | Average | Standard Deviation | Trial 1 | Trial 2 | Average | Standard Deviation |
| TPU-GPS | 27.67 | 25.87 | 26.77 | 1.27 | 27.60 | 26.23 | 26.92 | 0.97 | 108.64 | 104.68 | 106.66 | 2.80 | 19.63 | 20.59 | 20.11 | 0.68 |
| TPU-GPS-1GLY | 32.17 | 27.67 | 29.92 | 3.18 | 30.50 | 30.32 | 30.41 | 0.13 | 115.92 | 122.40 | 119.16 | 4.58 | 23.40 | 22.56 | 22.98 | 0.59 |
| TPU-GPS-3GLY | 39.00 | 42.66 | 40.83 | 2.59 | 39.15 | 32.80 | 35.98 | 4.49 | 135.60 | 129.68 | 132.64 | 4.19 | 26.36 | 27.56 | 26.96 | 0.85 |

**Table S3**. Conductivity of the graphene oxide-glycerol strain sensor

| **Sample** | **Conductivity (μS)** |
|---|---|
| TPU-GPS | 0.98 |
| TPU-GPS-1GLY | 1.20 |
| TPU-GPS-3GLY | 2.00 |

**Table S4.** Gauge Factors of different strain sensors as reported in the literature and comparing them in our current work

| Material | Gauge Factor | Ref. |
|---|---|---|
| TPU-GPS-3GLY | 20.80 | This work |
| TPU-GO-PEG-$SiO_2$ | 9.01 | 14 |
| Graphene on PET | 9.49 | 10 |
| TPU-PEDOT | 10.00 | 9 |
| Graphene textile | 1.7 | 38 |

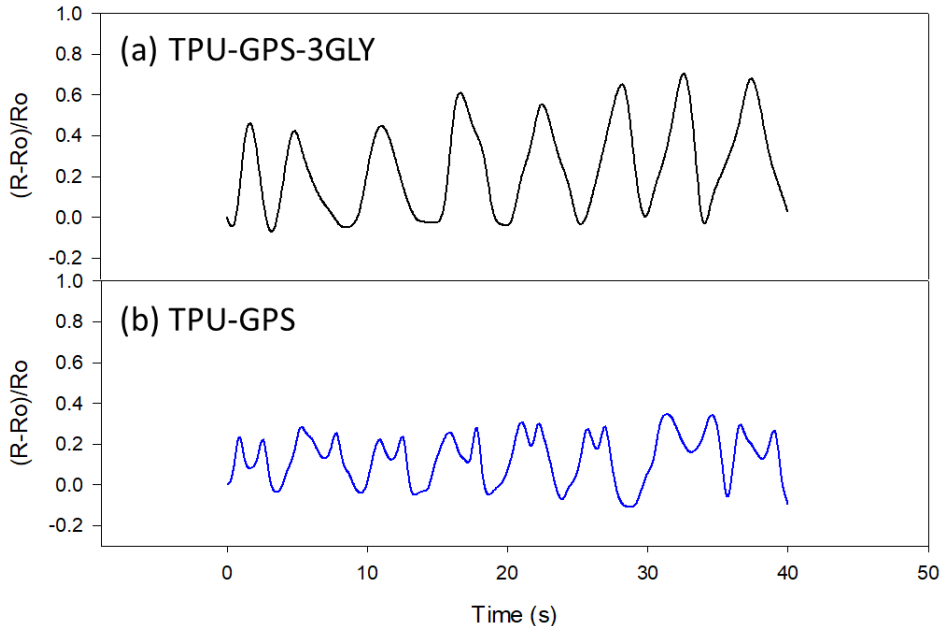


**Figure S2**. Human sensing application (finger bending) using the TPU-GPS-GLY sensors

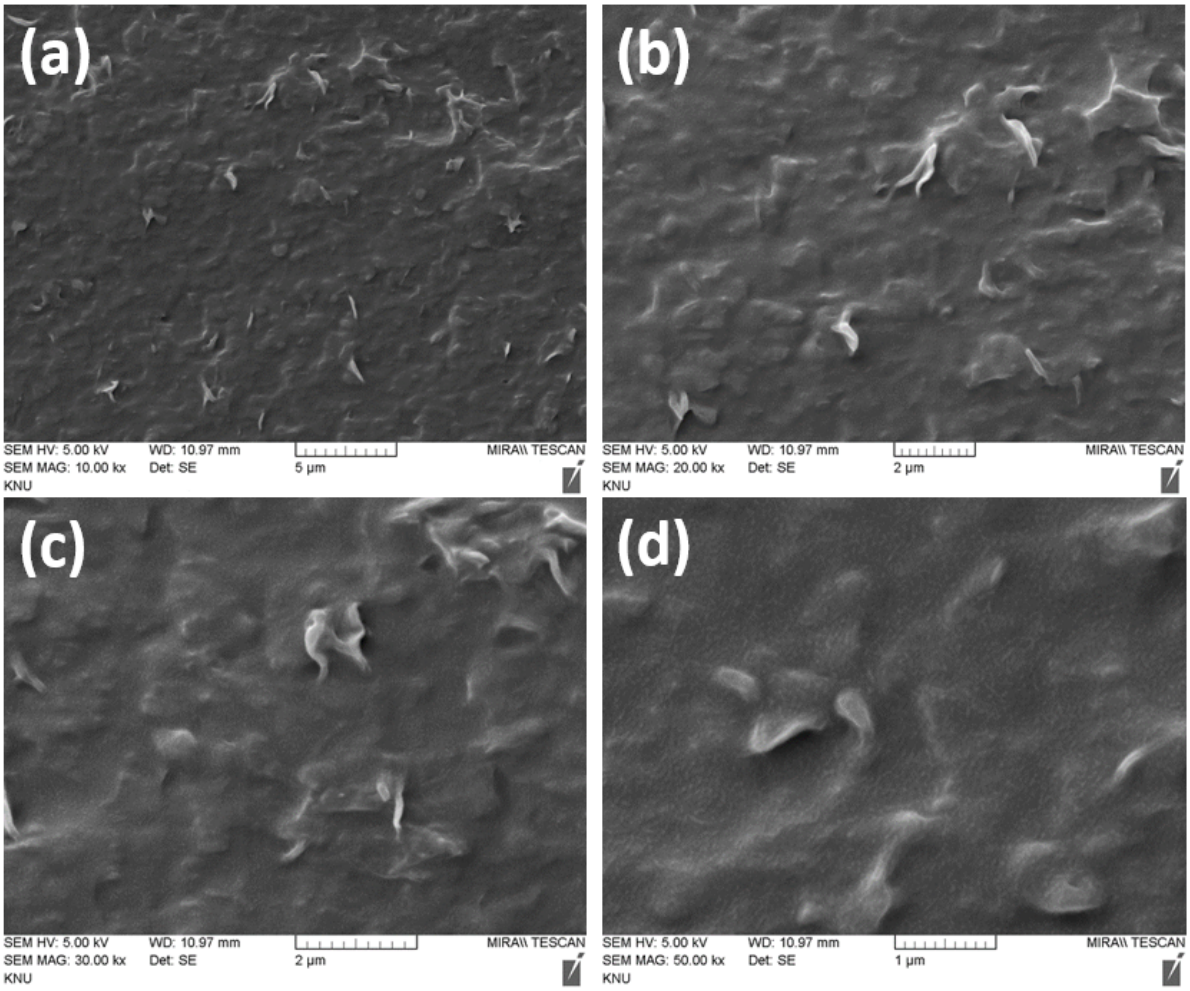


**Figure S3.** Morphology of TPU-GPS strain sensor at various magnifications (a) 10k (b) 20k (c) 30k and (d) 50 k showing the gradual deformation of the surface morphology

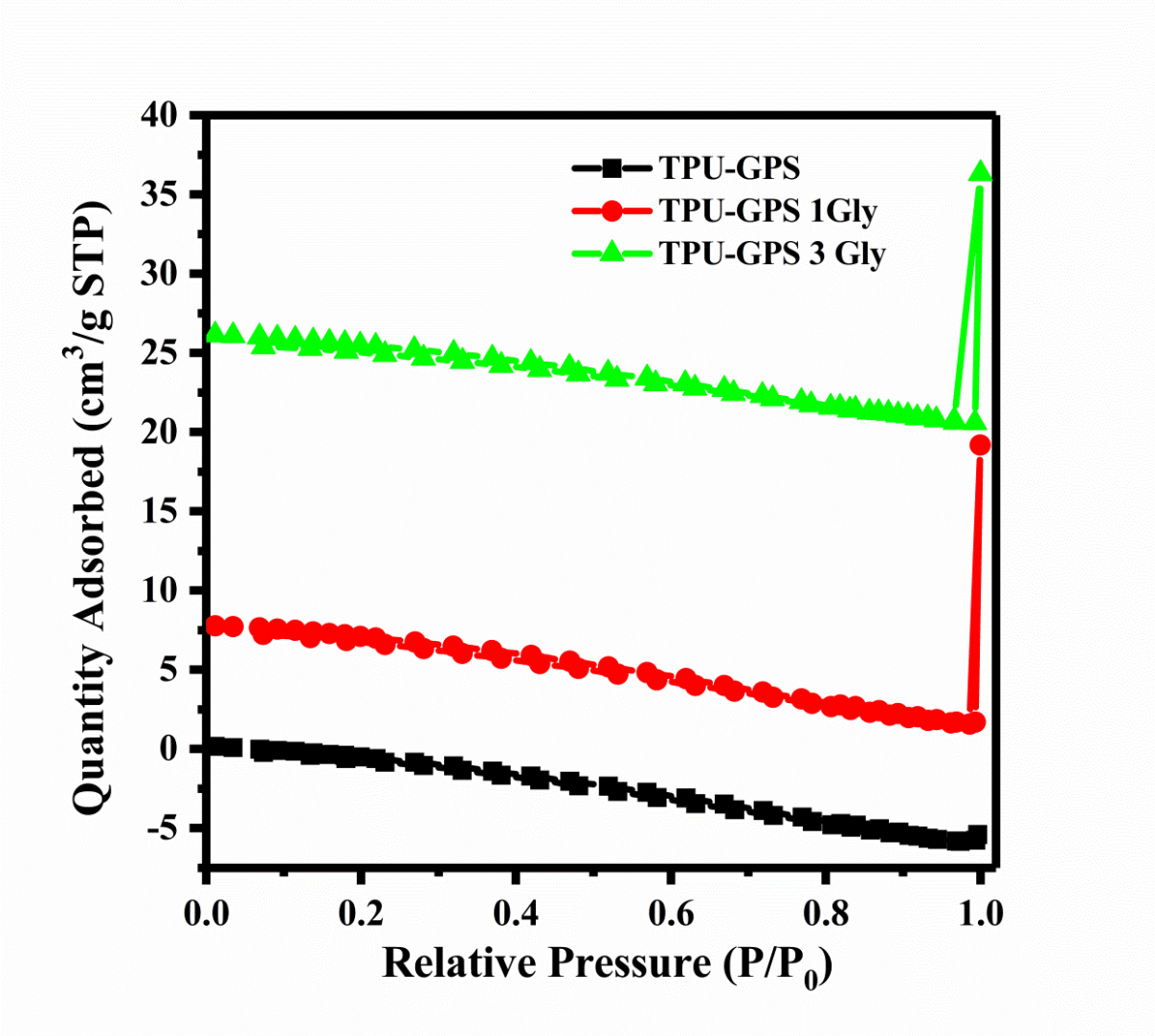


**Figure S4.** BET analysis of the TPU-GPS, TPU-GPS-1Gly and TPU-GPS-3Gly strain sensors showing higher $N_2$ adsorbed amounts for glycerol plasticized sensors.

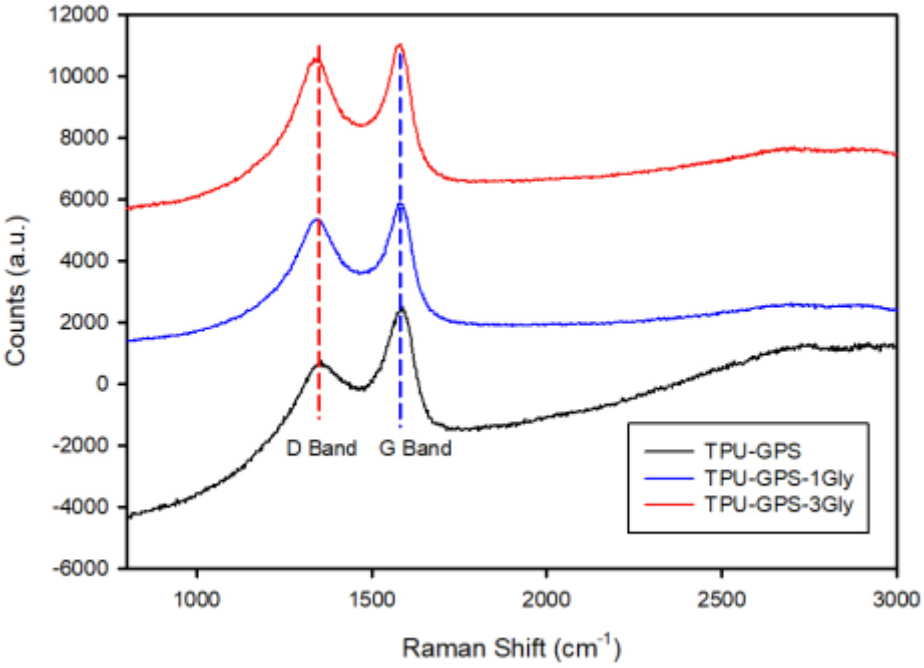


**Figure S5.** Raman spectra showing D band and G band for TPU-GPS and 1 & 3% glycerol plasticized strain sensors showing the increase in the intensity of D band upon the addition of glycerol plasticizer due to the presence of abundant hydroxyl functional groups.

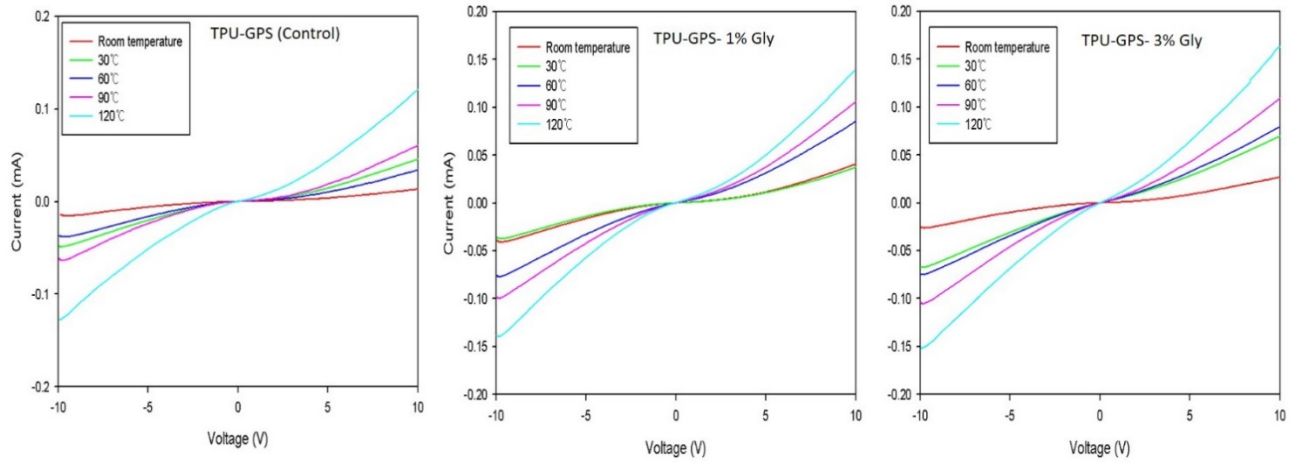


**Figure S6.** I-V curves generated at various temperatures (room temperature to 120°C) for TPU-GPS, TPU-GPS-1%Gly and TPU-GPS-3%Gly strain sensors showing higher conductivity at higher temperatures.

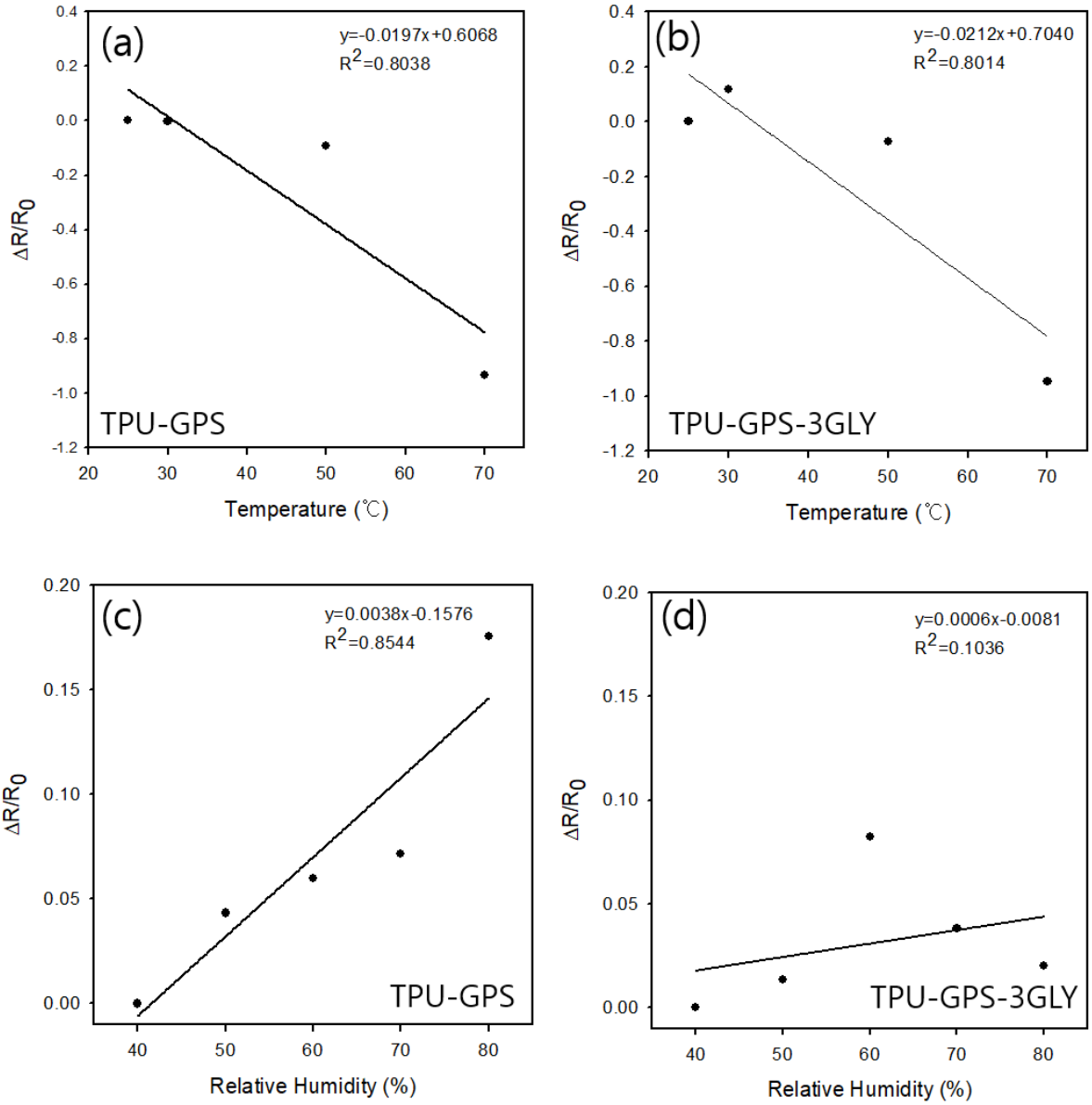


**Figure S7**. Resistance of variations as a function of (a,b) temperature as well as (c, d) relative humidity

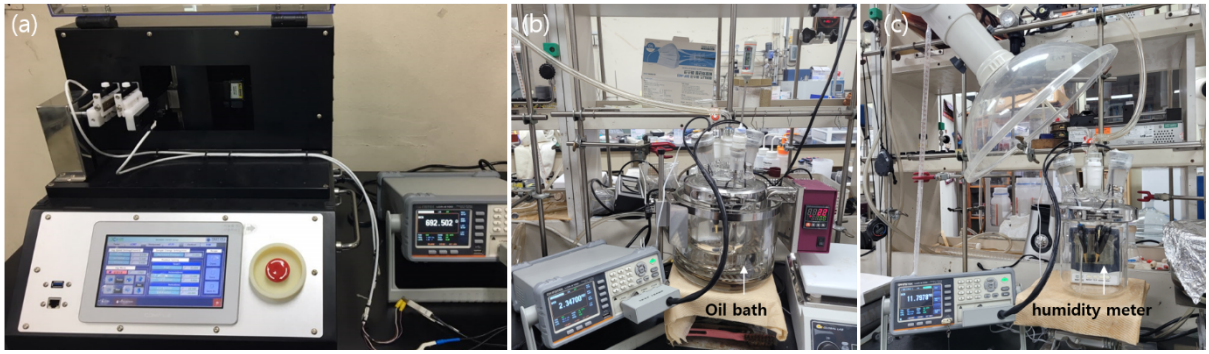


**Figure S8**. Photograph of (a) multi-purpose flexibility test machine for strain sensing, (b) Temperature variable chamber for resistance test machine (c) Humidity variable chamber for resistance test machine