

Figure S1: EDX spectra showing the porous and matrix elemental analysis.

### Polymer matrix

| Element | Wt%   | Wt% Sigma |
|---------|-------|-----------|
| C       | 53.24 | 1.83      |
| N       | 17.5  | 2.49      |
| O       | 18.57 | 1.1       |
| Na      | 0.79  | 0.11      |
| Mg      | 0.29  | 0.07      |
| Si      | 7.21  | 0.3       |
| Cl      | 0.29  | 0.06      |
| Ca      | 1.52  | 0.12      |
| Au      | 0.6   | 0.25      |
| Total:  | 100   |           |

### Porous walls

| Element | Wt%   | Wt% Sigma |
|---------|-------|-----------|
| C       | 41.1  | 2.41      |
| N       | 6.97  | 3.34      |
| O       | 7.75  | 1.11      |
| Na      | 2.06  | 0.23      |
| Mg      | 0.96  | 0.16      |
| Si      | 31.28 | 1.58      |
| Ca      | 8.85  | 0.57      |
| Au      | 1.02  | 0.68      |
| Total:  | 100   |           |

Figure S2: variation in porosity distribution (mean and SD, N=300) over several concentrations (table S1) of GNWs filling the pores.

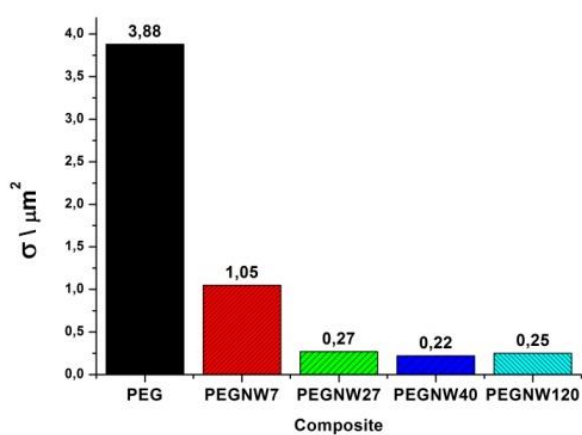
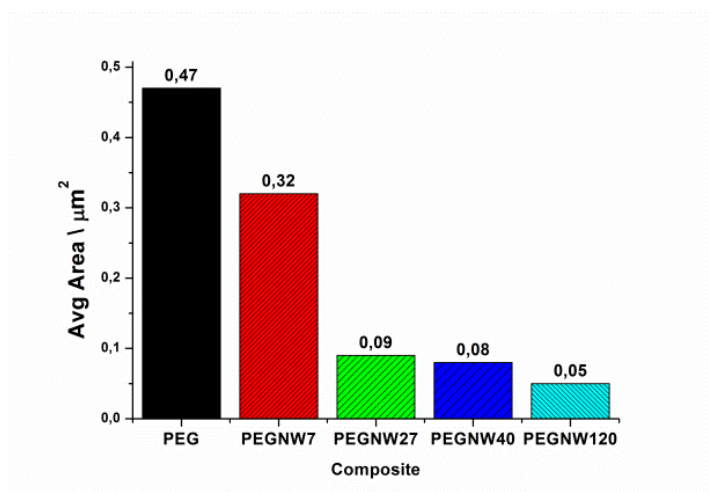


Table S1. Emulsions' compositions.

| PEGDA (ml) | Darocur1173 (2% wt vs. PEGDA) (mg) | Pluronic 360mg/ml (μl) | GNWs (μl) | PANI-CSA (μl) | Concentration of PANI-CSA in DMC (mg/ml) |
|------------|------------------------------------|------------------------|-----------|---------------|--|
| 1          | 22                                 | 100                    | 100       | 100           | 1  |
| 1          | 22                                 | 100                    | 100       | 100           | 5  |
| 1          | 22                                 | 100                    | 100       | 100           | 10                                       |
| 1          | 22                                 | 100                    | 100       | 100           | -  |
| 1          | 22                                 | 100                    | 100       | 100           | -  |
| 1          | 22                                 | 100                    | 100       | 100           | -  |