Electronic Supplementary Material (ESI) for Materials Advances.


# *Supporting Information*

## Classical nexus between chiral inducers and achiral silver nanoparticles and integration of digital XOR logic gate

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## Contents



### 1. Device fabrication and electrical characterization

The colloidal solution of Chiral nanoparticles was drop-casted on Indium doped tin oxide (ITO) glasses and dried at room temperature in a vacuum. Then another clean ITO was taken and coated with gel electrolyte. Two electrodes as top and bottom electrodes were joined together to complete the device fabrication. After the device fabrication, we dry it in an overnight vacuum. A blank device containing only gel electrolytes was also prepared for comparison. Current-voltage (I-V) measurements were performed on Source meter Keithley 2604B. The device made by joining only two ITO glasses and another one having gel electrolytes between two ITO showed a perfect ohmic behavior (Figure S9) when the applied voltage was -0.5 V to +0.5 V.

### 2. EIS and circuit modeling

Solid state EIS and circuit modeling of devices were studied by using GAMRY Reference 600+ potentiostat.

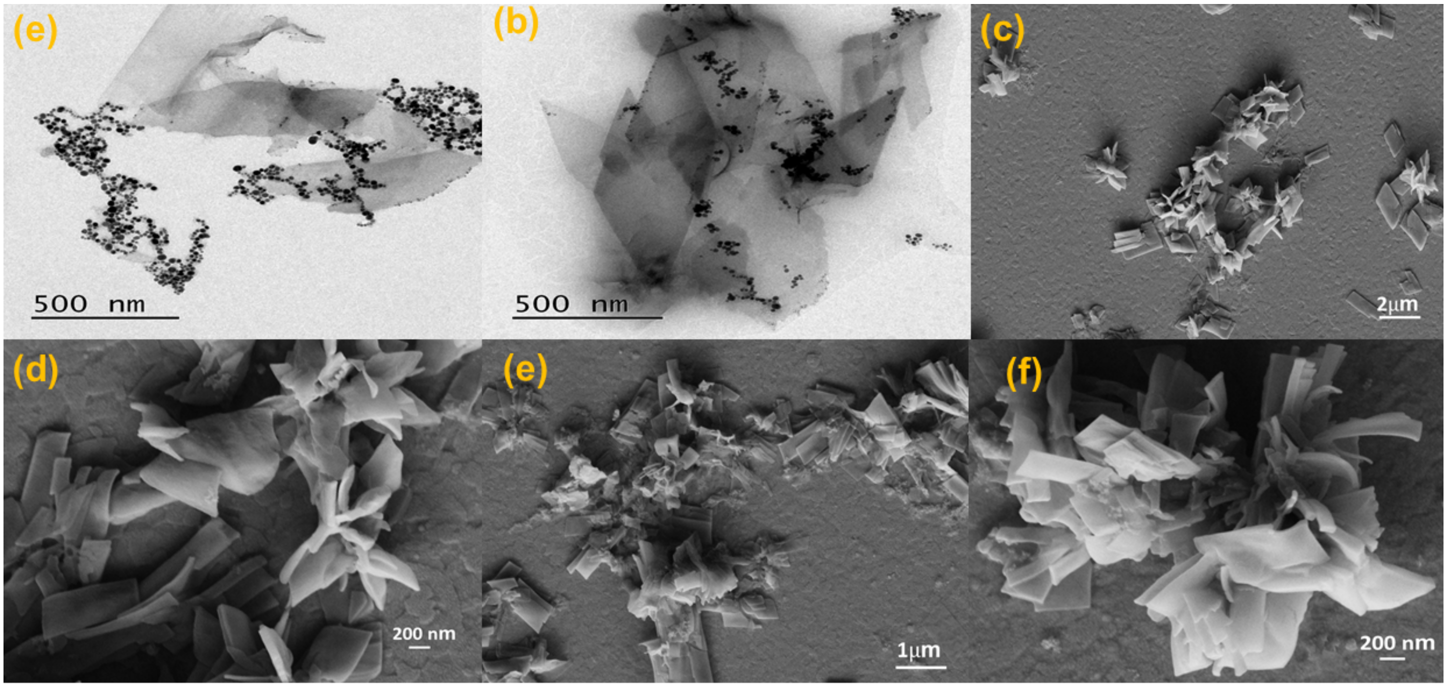


**Fig. S1.** (a-b) TEM image of D-Cys@AgNPs, (c-d) FE-SEM images of L-Cys@AgNPs, and (e-f) FE-SEM images of D-Cys@AgNPs.

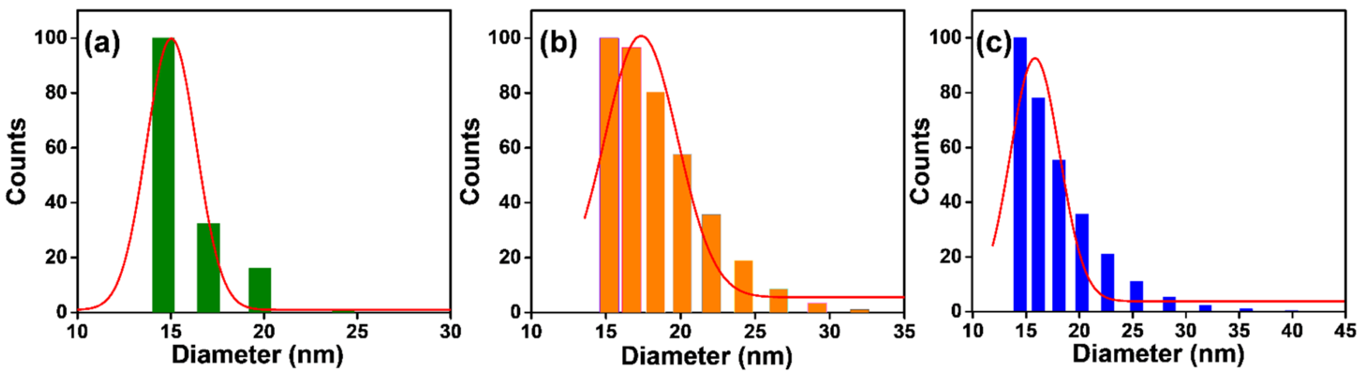


**Fig. S2.** DLS size distribution of (a) Ag NPs, (b) L-Cys@Ag NPs and (c) D-Cys@Ag NPs.

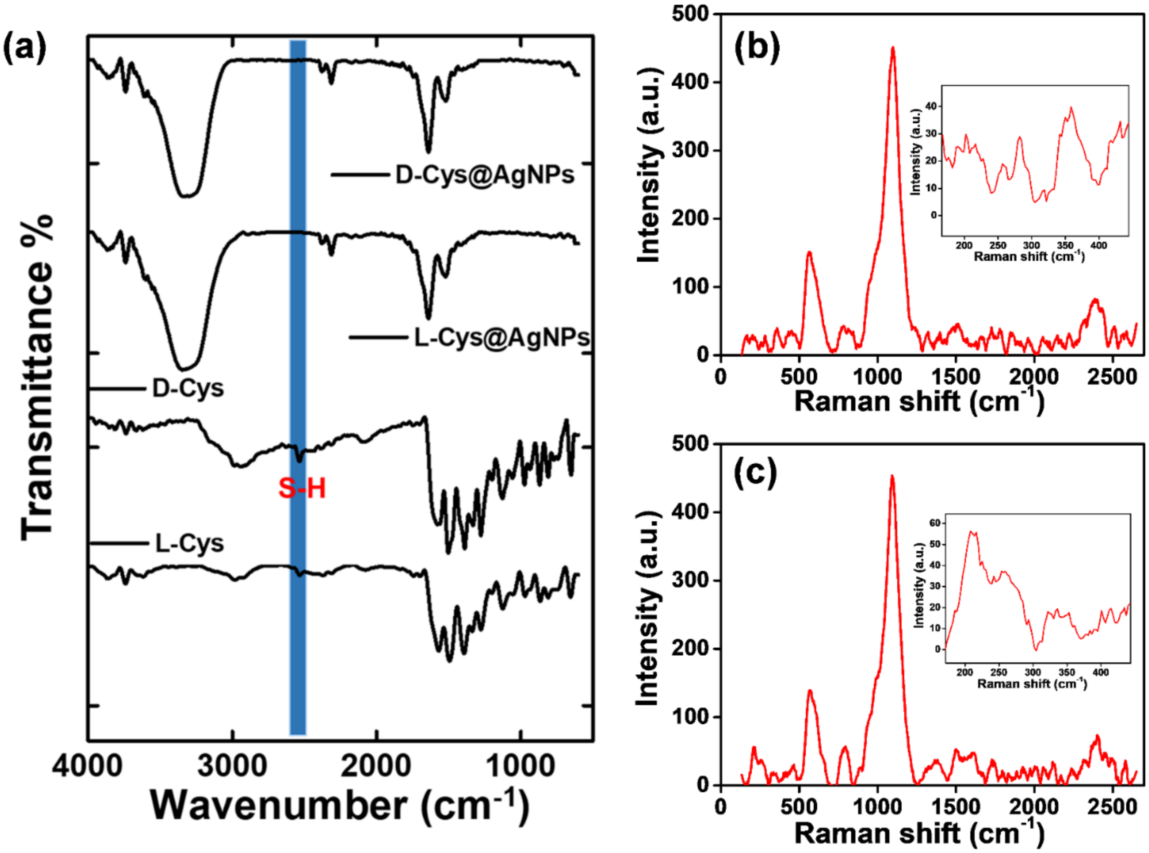


**Fig. S3.** (a) Comparison (L cys, D-cys, L Cys-Ag Nps, D Cys-Ag NPs) of FT-IR spectra, (b) Raman spectra of L-Cys@Ag and (c) Raman spectra of D-Cys@Ag NPs are shown.

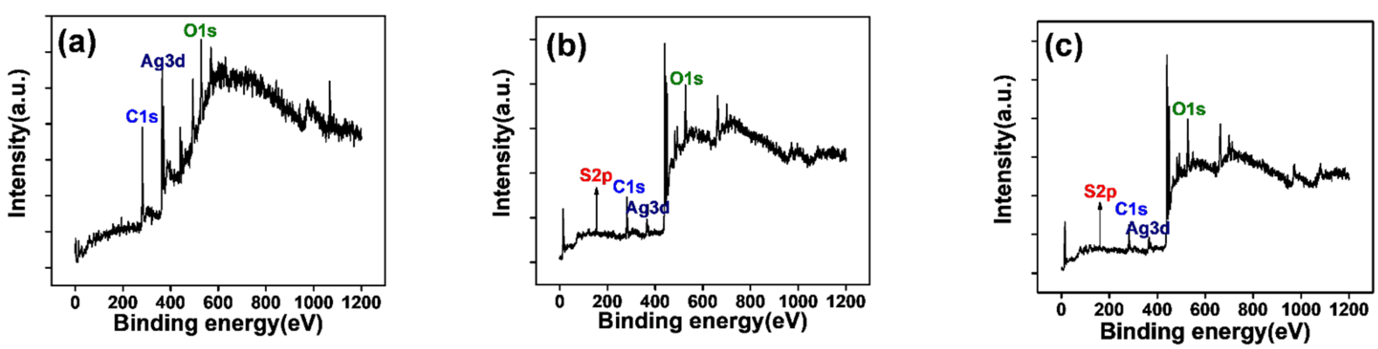


**Fig. S4.** Full scan survey XPS spectrum of (a) Ag NPs, (b) L-Cys@Ag, (c) D-Cys@Ag NPs.

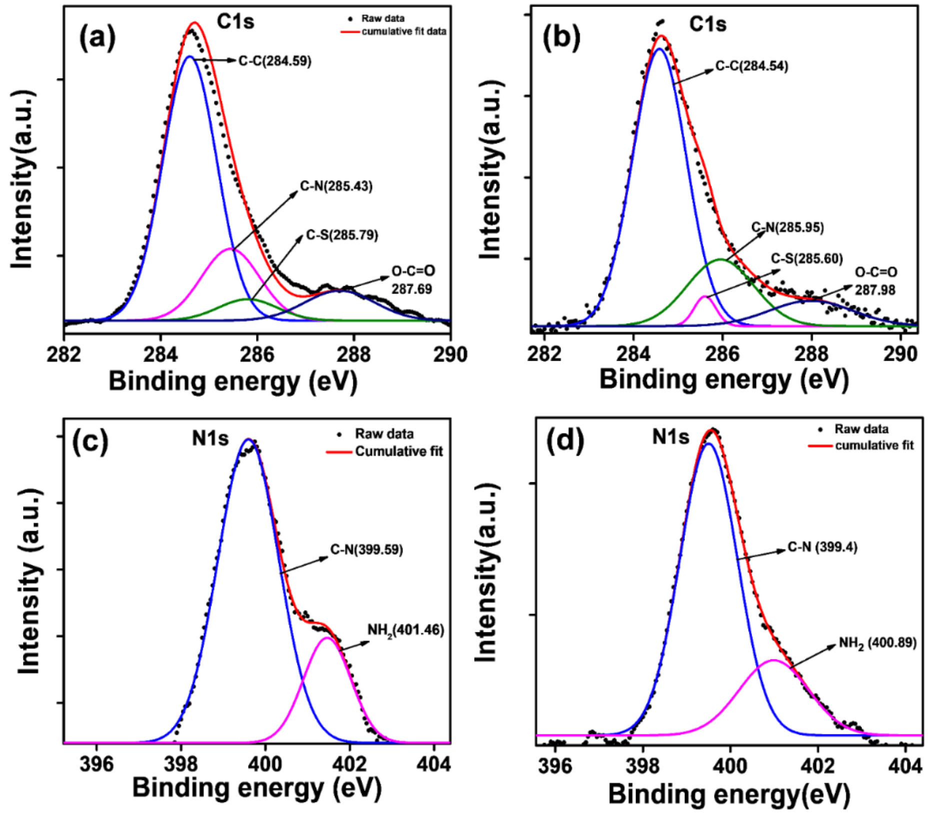


**Fig. S5.** (a-b) expended and deconvolated spectra of C1s of L-Cys@Ag and D-Cys@Ag NPs, and (c-d) expended and deconvolated spectra of N1s of L-Cys@Ag and D-Cys@Ag NPs.

**Table S1.** XPS analysis of Ag NPs, L-Cys@Ag and D-Cys@AgNPs.

| S.N. | Material | Elements | State/terms | Binding energy (eV) |
|---|---|---|---|---|
| 1. | Ag NPs | Ag | Ag $3d_{3/2}$ | 373.30 |
| | | | Ag $3d_{5/2}$ | 367.30 |
| | | C | 1s | 284.76 |
| 2. | L-Cys@AgNPs | Ag | Ag $3d_{3/2}$ | 373.86 |
| | | | Ag $3d_{5/2}$ | 367.87 |
| | | C | 1s | 284.61 |
| | | S | $2p_{1/2}$ | 167.72 |
| | | | $2p_{3/2}$ | 162.61 |
| | | N | 1s | 399.60 |
| | | O | 1s | 531.80 |
| | | Ag | Ag $3d_{3/2}$ | 373.44 |
| | | | Ag $3d_{5/2}$ | 367.44 |
| | | C | 1s | 284.90 |

| | | | | |
|---|---|---|---|---|
| 3. | D-Cys@AgNPs | S | $2p_{1/2}$ | 167.94 |
| | | | $2p_{3/2}$ | 162.08 |
| | | N | 1s | 399.55 |
| | | O | 1s | 531.50 |

**Table S2.** The optical rotation of L-Cys, D-Cys, L-Cys@Ag and D-Cys@Ag NPs at different concentrations.

| Sl. No. | Chiral nanoparticles | Optical rotation (degree) |
|---|---|---|
| 1 | L-Cysteine 10mM | -0.008 |
| 2 | D-Cysteine 10mM | 0.004 |
| 3 | L-Cysteine 5mM | -0.003 |
| 4 | D-Cysteine 5mM | 0.002 |
| 5 | L-Cys@AgNPs 10mM | -0.050 |
| 6 | D-Cys@AgNPs 10mM | 0.027 |
| 7 | L-Cys@AgNPs 5mM | -0.030 |
| 8 | D-Cys@AgNPs 5mM | 0.019 |

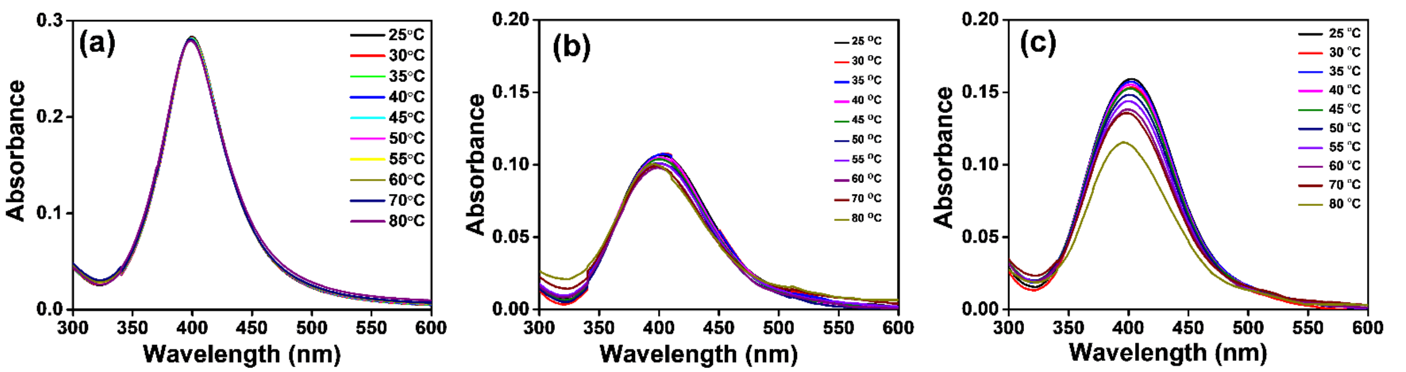


**Fig. S6.** Temperature dependence UV-vis Spectra of (a) Ag NPs, (b) L-Cys@Ag and (c) D-Cys@Ag NPs.

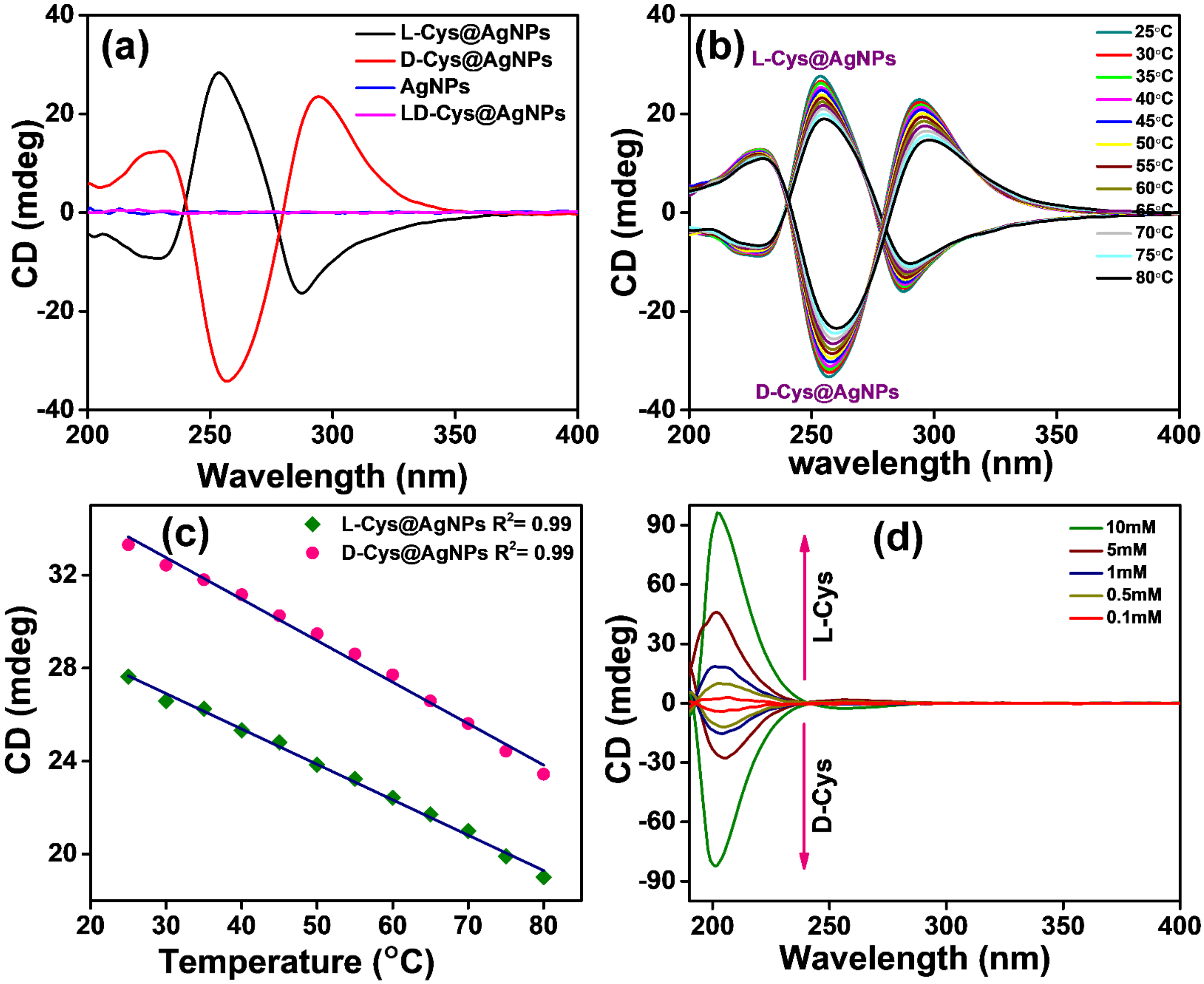


**Fig. S7.** (a) CD spectra at 5 mM concentration of L/D-Cys@Ag NPs and (b)Temperature dependence CD spectra at 5 mM concentration of L/D-Cys@Ag NPs, (c) plot of temperature vs maximum CD intensity (temperature was increased from 25 °C to 80 °C at an interval of 5 °C) and (d) concentration-dependent CD spectra of L-Cys and D-Cys.

**Table S3**. Values of various components of fitted equivalent circuit model.

| S.N. | Composition | $R_{cntc}$ (Ω) | C (µF) | $R_{Ct}$ (Ω) | CPE (µF $s^{(\alpha-1)}$) | Exponent (n) |
|---|---|---|---|---|---|---|
| 1. | Ag NPs | 78.81 | 0.72 | 57.06 | 7.26 | 0.68 |
| 2. | L-Cys@Ag NPs | 78.90 | 2.26 | 341.20 | 3.61 | 0.77 |
| 3. | D-Cys@Ag NPs | 82.33 | 2.72 | 203.4 | 4.51 | 0.80 |

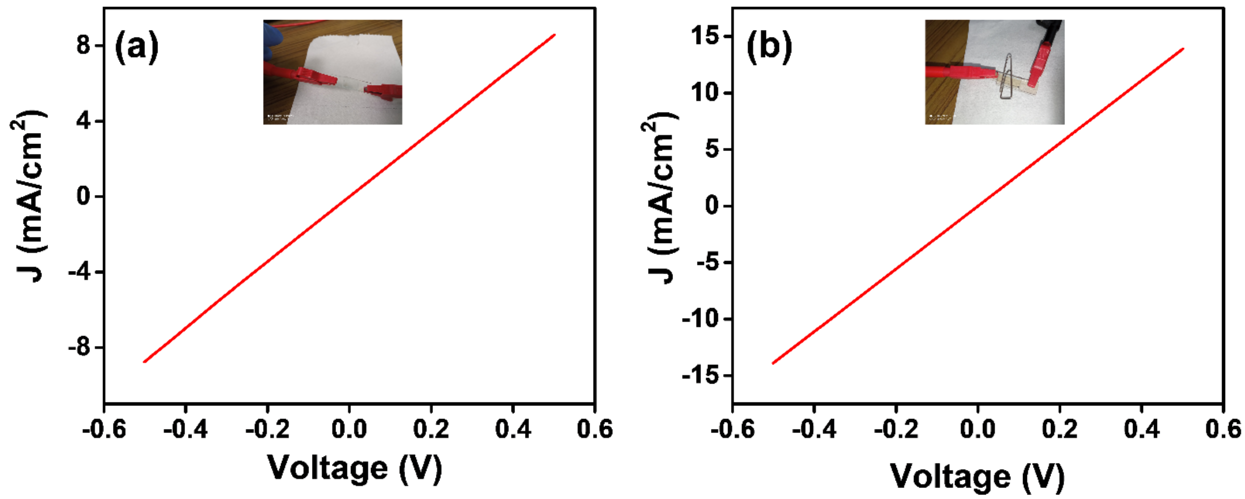


**Fig. S8.** (a-b) Plots of current density vs applied voltage for the references electrical device made using gel between two ITO, and directly contacted two freshly cleaned ITOs (without gel), respectively. Linear J-V behavior indicates Ohmic characteristics, while Ag NPs or L/D-Cys capped Ag NPs reveal non-ohmic features.

## References


1 D. R. Bae, W. S. Han, J. M. Lim, S. Kang, J. Y. Lee, D. Kang and J. H. Jung, *Langmuir*, 2010, **26**, 2181–2185.

2 J. Wang, S.-S. Zhang, X. Xu, K.-X. Fei and Y.-X. Peng, *Nanomaterials*, 2018, **8**, 1027.