Electronic Supplementary Material (ESI) for Journal of Materials Chemistry
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Electronic Supplementary Information (ESI) for

A facile synthesis of uniform Ag nanoparticles decorated CVD-grown graphene *via* surface engineering

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1. Raman spectroscopic changes (D, G and 2D) corresponding with the exposure time, input and distance.

Table S1. Raman intensity ratio of D, G, and 2D and I(D)/I(G) in terms of oxygen plasma treatment based on three variables including exposure time, input power and distance between the graphene and the electrode.

Plasma treatment	**Condition**	**D***	**G***	**2D***	***I(D)/I(G)***
Exposure time	5 s	1.30	0.64	0.38	0.20
	10 s	3.16	0.36	0.23	0.47
	15 s	4.07	0.31	0.20	0.70
	20 s	6.51	0.20	0.11	0.79
Input power	100 w	1.15	0.96	0.92	0.19
	150 w	1.60	0.81	0.78	0.37
	200 w	2.45	0.69	0.43	0.62
Distance	5 mm	5.61	0.65	0.38	0.86
	8 mm	3.25	0.77	0.52	0.65
	11 mm	1.25	0.93	0.91	0.17

D*, G* and 2D* are the intensity ratio of *Plasma treatment with three variables/Few layered pristine graphene*.

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2. XPS spectra of overall AgNPs-G and C 1s for various OPFG

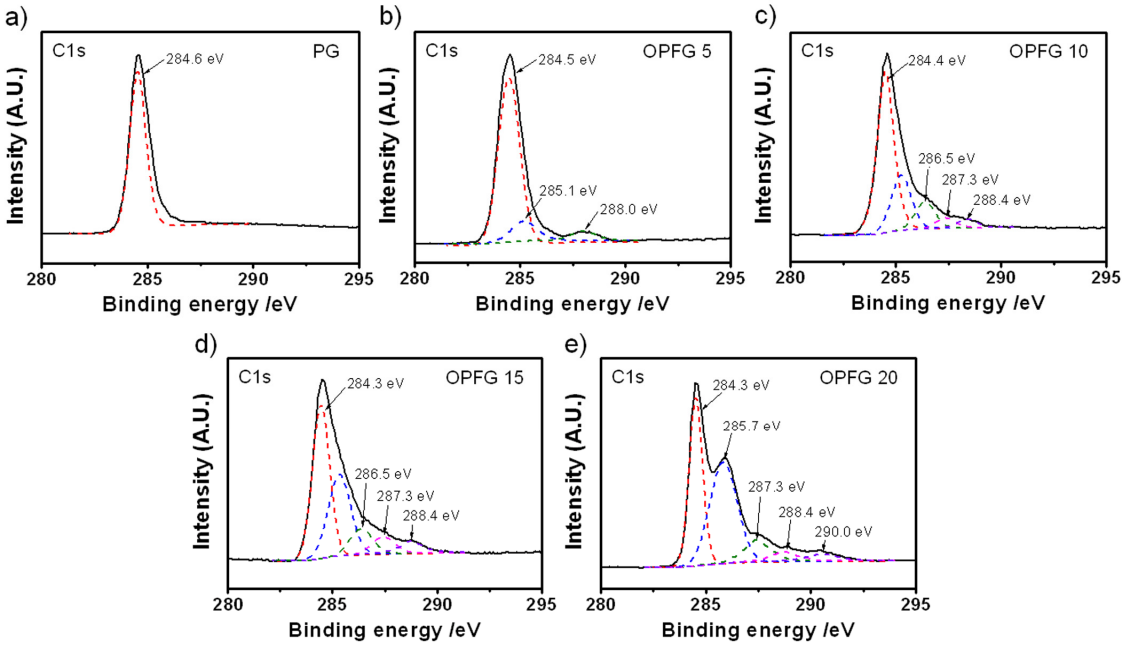

Fig. S1 XPS spectra of the high resolution of C1s for a) PG, b) OPFG 5, c) OPFG 10, d) OPFG 15 and e) OPFG 20. Increase of oxygen plasma exposure time results in increase of oxygen-containing functional groups which are active sites to anchor Ag metal nanoparticles onto the OPFG.

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3. Static contact angle on oxygen plasma treated few-layer graphene (OPFG)

Table S2. Contact angle of water and diiodomethane (CH_2I_2) on OPFG film at different oxygen plasma exposure time

Exposure time [s]	θw_{ater} [°]	$\theta_{Diiodomethane}$[°]
0	88.1±0.09	41.9±0.02
5	62.3±0.20	32.2±0.02
10	60.2±0.19	28.8±0.01
15	54.7±0.08	26.8±0.15
20	46.0±0.15	20.0±0.01

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4. Surface energy of OPFG

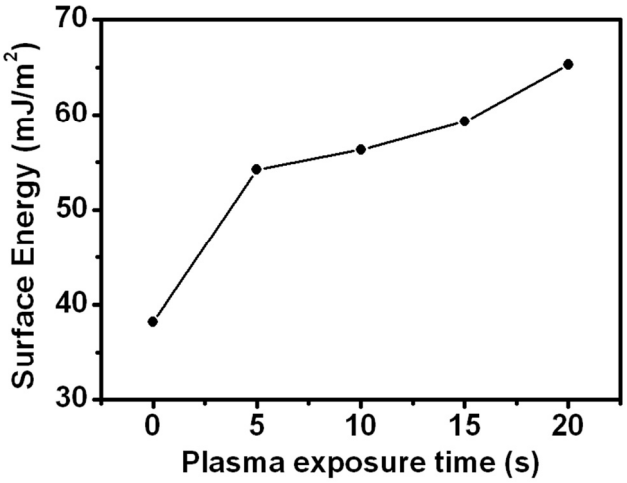

Fig. S2 Surface energy of OPFG film as a function of plasma exposure time at room temperature; Total surface energy is known to be the sum of dispersive and polar fractions.

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5. Electron paramagnetic resonance (EPR) analysis for AgNPs-G reduction mechanism

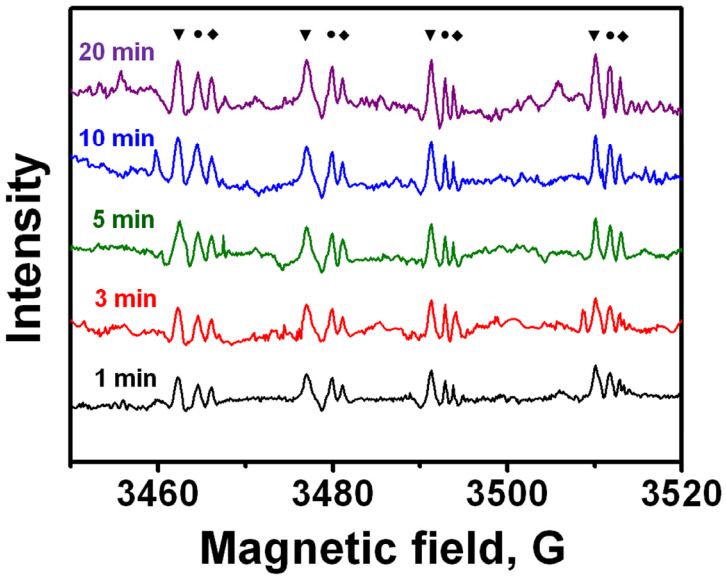

Fig. S3 Electron paramagnetic resonance (EPR) signals of the OPFG with DMPO-$^{\bullet}$OH/carbon-centered/$^{\bullet}$OCH adducts as a function of UV-light irradiation time (DMPO: 0.15M) ; ▼ DMPO/carbon-centered radical adduct, ● DMPO/carbonyl radical adduct, ♦ DMPO/hydroxyl radical adduct.

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6. The atomic percentages of the elementary compositions before and after thermal annealing process in AgNPs-G 15

Table S3. XPS atomic percentages of PG, OPFG 15, AgNPs-G 15, and annealed AgNPs-G 15

Samples	C [%]	O [%]	Ag [%]
PG	76.44	22.86	-
OPFG 15	71.38	28.21	-
AgNPs-G 15	69.64	23.53	5.16
Annealing	73.64	19.86	5.74

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7. AFM image of pristine graphene (PG)

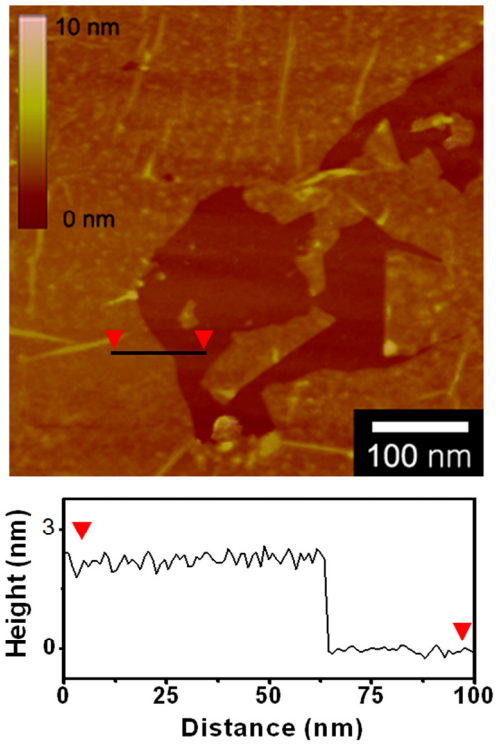

Fig. S4 AFM image of PG with 2.8 nm in average thickness

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8. Current-voltage plot of AgNPs-G in flat system

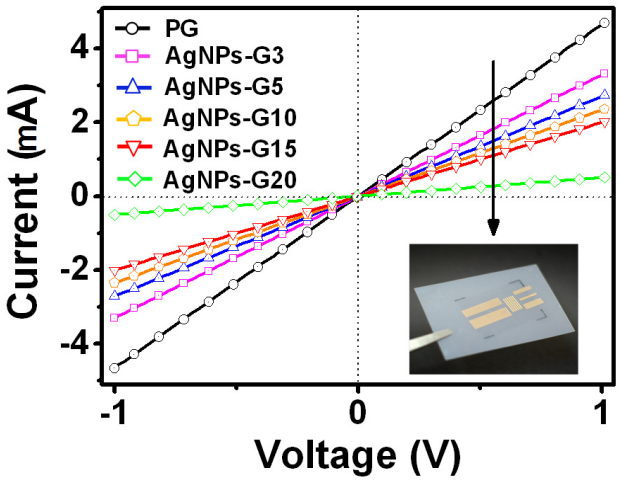

Fig. S5 Current-voltage curves of PG and AgNPs-G in flat system; Scan rate, V_{SD} = 0.1 V s^{-1} over a voltage range from –1 to +1 V

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9. Fatigue tests of AgNPs-G

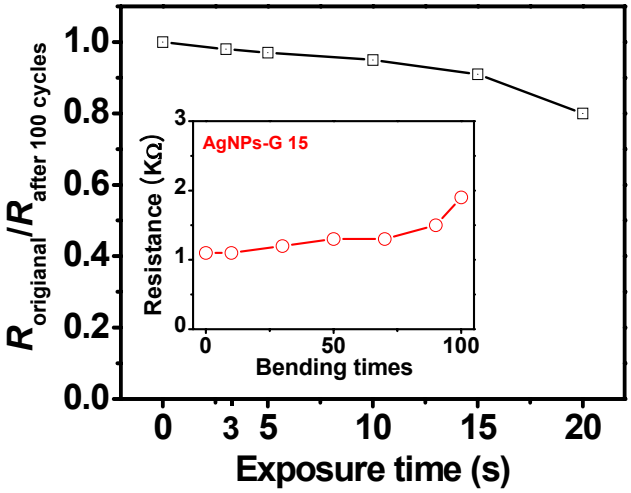

Fig. S6 Resistance ratio (original /after 100 cycles) in flat system of AgNPs-G film treated by oxygen plasma for different exposure time. The resistance of the AgNPs-G 15, as a function of bending cycles up to 100 cycles (inset).