Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Contents of this supplementary file:

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Table 1: Summary of the contents of the videoclips of the tricolored-blinking process

Video	Video File Name	Description of the video content
V1	V1.avi	Tricolored blinking phenomenon from laser patterned micro-star shape. This video corresponds to the result illustrated in Figure 2.
V2	V2.avi	Tricolored blinking phenomenon from laser patterned micro-square shape.
V3	V3.avi	Zoom in view of Tricolored blinking phenomenon from laser patterned AgO/Ag_n hybrid on rGO surface
V4	V4.avi	Isolated nanoblinkers scattered over the sample surface. This video corresponds to the result illustrated in Figure 3 and 4.
V5	V5.avi	To illustrate the effect of patterning speed on the density of tricolored-blinkers on the rGO film. Here the patterning speed is 25 □m/s.
V6	V6.avi	To illustrate the effect of patterning speed on the density of tricolored-blinkers on the rGO film. Here the patterning speed is 50 □m/s.
V7	V7.avi	To illustrate the effect of patterning speed on the density of tricolored-blinkers on the rGO film. Here the patterning speed is 100 □m/s.
V8	V8.avi	To illustrate the effect of patterning speed on the density of tricolored-blinkers on the rGO film. Here the patterning speed is 200 □m/s.
V9	V9.avi	Single isolated tricoloured blinker on SiN TEM grid. This video corresponds to the result illustrated in Figure 5.
V10	V10.avi	Tricoloured blinkers fabricated on carbon nanotubes.
V11	V11.avi	Tricoloured blinkers fabricated on SiO_2/Si wafer.
V12	V12.avi	Tricoloured blinkers fabricated on rGO after 11 days.
V13	V13.avi	Tricoloured blinkers fabricated on SiO_2/Si wafer after 11 days.
V14	V14.avi	Tricoloured blinkers fabricated on carbon nanotubes after 11 days.
V15	V15.avi	Patterned tricoloured blinkers before submerging in Rhodamine B dye.
V16	V16.avi	Patterned tricoloured blinkers after submerging in Rhodamine B dye for 10mins. Same sample as V20.
V17	V17.avi	Patterned tricoloured blinkers after submerging in Rhodamine B dye for 100mins.
V18	V18.avi	Tricoloured blinkers fabricated on PDMS.
V19	V19.avi	Tricoloured blinkers fabricated on PDMS after 21 days.
V20	V20.avi	Tricoloured blinkers fabricated on PDMS before bending
V21	V21.avi	Tricoloured blinkers fabricated on PDMS during bending
V22	V22.avi	Tricoloured blinkers fabricated on PDMS after bending

*All videos are set to 39 frames per second.

S1. Systematic studies to optimise the deposition of tricoloured blinkers on rGO film.

Power and speed dependent studies for controlled formation of AgNPs on GO substrate. Figure S1 depicts SEM and corresponding FM images (under 450-500nm excitation) of the deposited Ag NPs.

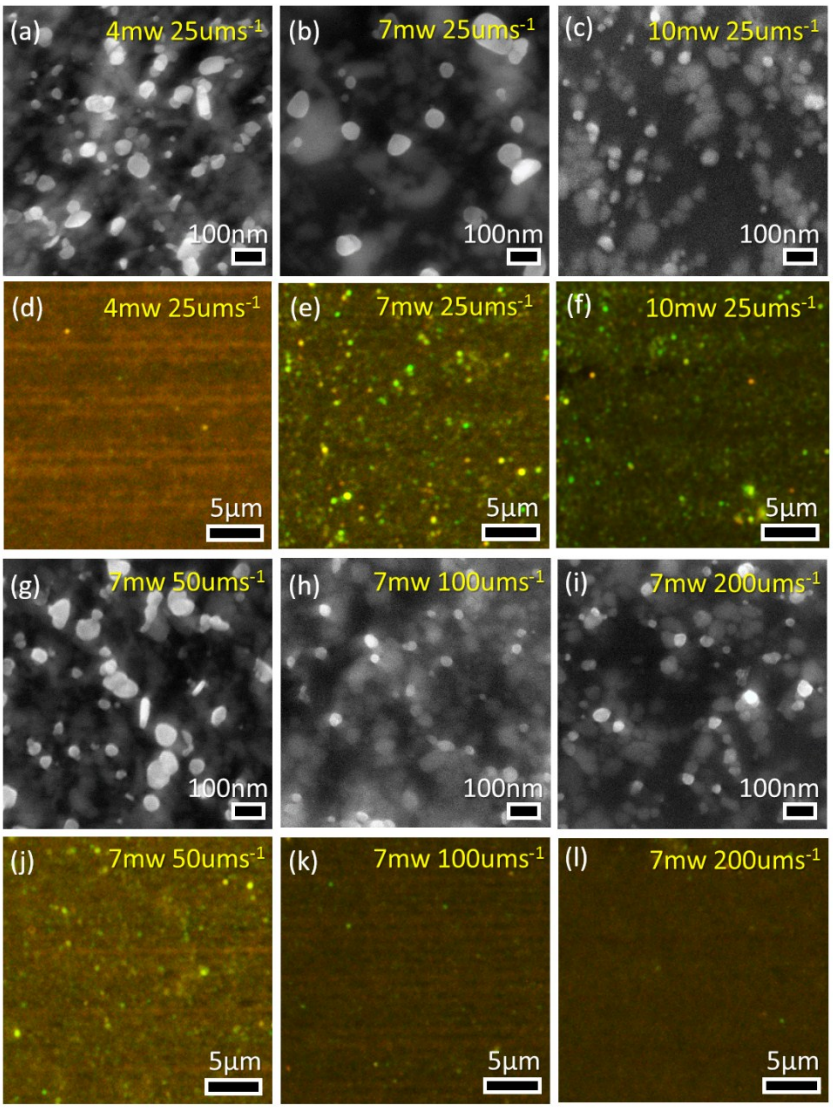

Figure S1. (a-c) SEM images of Ag NPs formed on GO under irradiation of (a) 4mW, (b) 7mW and (c) 10mW of 532nm laser. Speed of the patterning process was maintained at 25µms^{-1}. (d-f) Corresponding FM images under blue illumination (450-500nm). (g-i) SEM images of Ag NPs formed on GO under the irradiation of 7mW of 532nm laser with speed of the patterning process being set at (g) 50ums^{-1}, (h) 100ums^{-1} and (i) 200ums^{-1}. (j-l) Corresponding FM images under blue illumination (450-500nm).

S2. Importance of localised laser initiated reduction of GO in metal ion precursors ($AgNO_3$).

Importance of localised laser initiated reduction of GO in metal ion precursors ($AgNO_3$). Figure S2(a) shows region of GO patterned in the absence of $AgNO_3$. From the patterned region, no fluorescence was observed. Repeating the same patterning process in the presence of AgNO yielded red, yellow and green fluorescence from the deposited Ag NPs (Figure S2(b)).

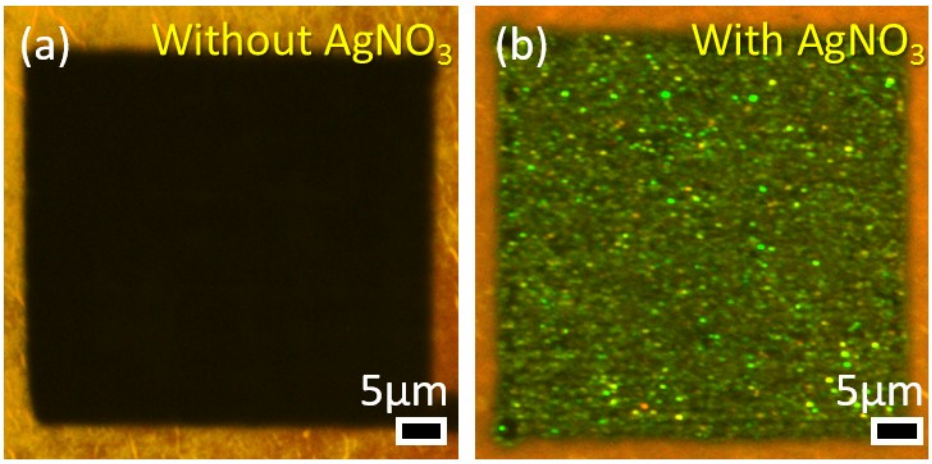

Figure S2. FM images of laser patterning of GO in the (a) absence and (b) presence of $AgNO_3$ solution. Resulting in no formation of AgNPs in (a) and AgNPs decorated "Square" in (b).

S3. TEM analysis of deposited green fluorescence AgNPs.

TEM analysis of deposited green fluorescence AgNPs. Figure S3 shows the TEM and SAED analysis of non-blinking but fluorescing NPs. Figure S3(a) shows the TEM image of the region within the red dotted box shown in the inset FM image (under blue light excitation (450-500 nm)). The demarcated red dotted box shows stable green fluorescence without blinking. Located near the red dotted box is a big NP responsible for bright yellow fluorescence without blinking. The typical size of these yellow fluorescence non-blinking NPs is in the micron-meter range. Figure S3(b) shows the SAED image of the region within the red dotted box. AgO crystal was not detected from the NPs responsible for the background green fluorescence. The rings from the SAED image suggests that the Ag NPs comprises of FCC (200) type and HCP (202) type crystalline structures. For the NP responsible for yellow fluorescence, the NP was too thick to obtain meaningful HR-TEM or SAED images.

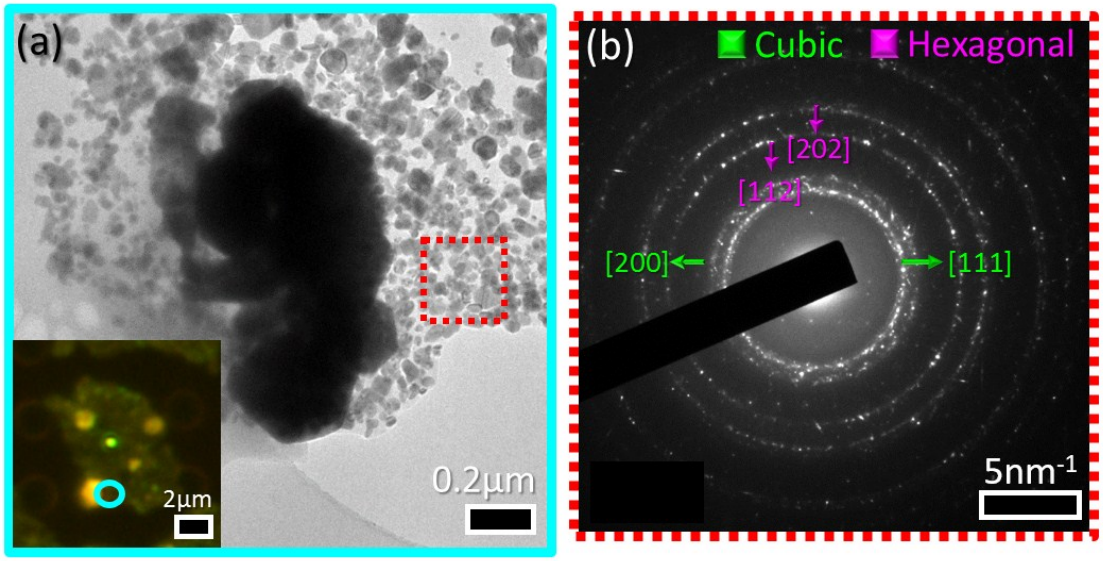

Figure S3. (a) TEM image of the region where the blue circle shown in the FM inset is located. (b) SAED of the region identified within the red dotted box in (a). Analysis of the diffracted rings shows the presence of FCC (200) type and HCP (202) type crystalline structures.

S4. Importance of defect sites as electron traps.

Importance of defect sites as electron traps. Figure S4 shows the results of laser initiated deposition of Ag NPs on both CNTs (Figure S4(a-d)) and SiO_2 (Figure S4(e-h)) surfaces. The deposited AgNPs on both surfaces exhibited tricoloured blinking phenomenon. This in turn provided strong evidence for the mechanism proposed in the main manuscript.

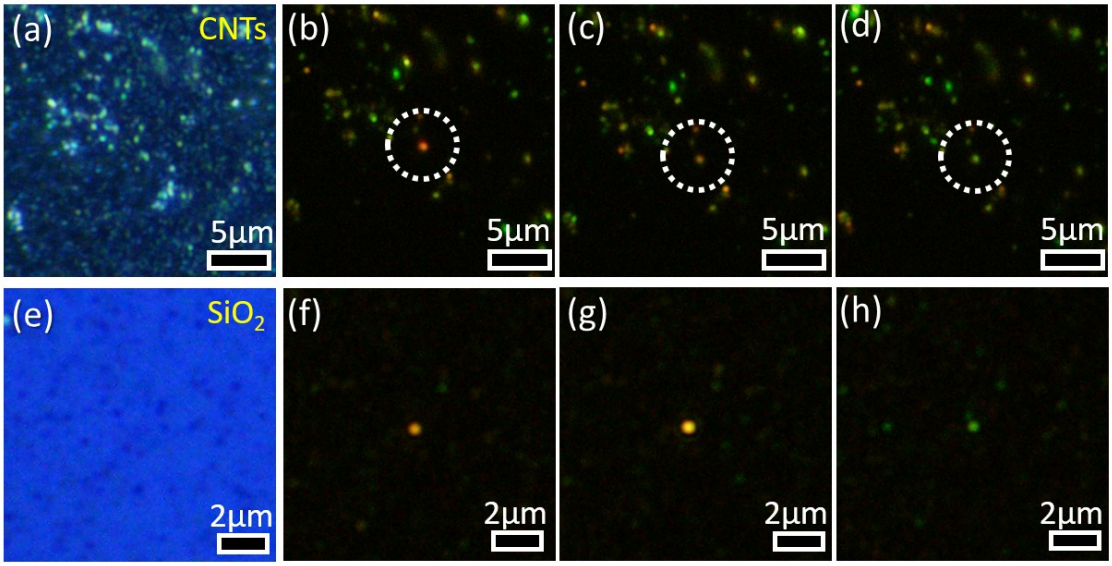

Figure S4. (a, e) BF optical images of AgNPs on (a) CNTs array and (e) oxygen etched SiO_2 wafer. (b-d, f-h) shows the corresponding FM images of (b-d) CNTs and (f-h) SiO_2 under blue excitation (450-500nm) with time sequence showing the presence of tricoloured blinking.

S5. Importance of environmental stability for sustained and durable blinking behaviour of the NPs.

Importance of environmental stability for sustained and durable blinking behaviour of the NPs. For GO film (Figure 5(a-b)) and CNT (Figure 5(e-f)), the tricoloured blinkers continued blinking under blue light excitation 11 days after deposition. For oxygen etched SiO_2 (Figure 5(c-d)), most of the blinkers stopped blinking after 11 days. This is despite the fact that AgNPs were still found on the surface of SiO_2 as seen from the dark field images (Inset of Figure S5 (c)-(d)).

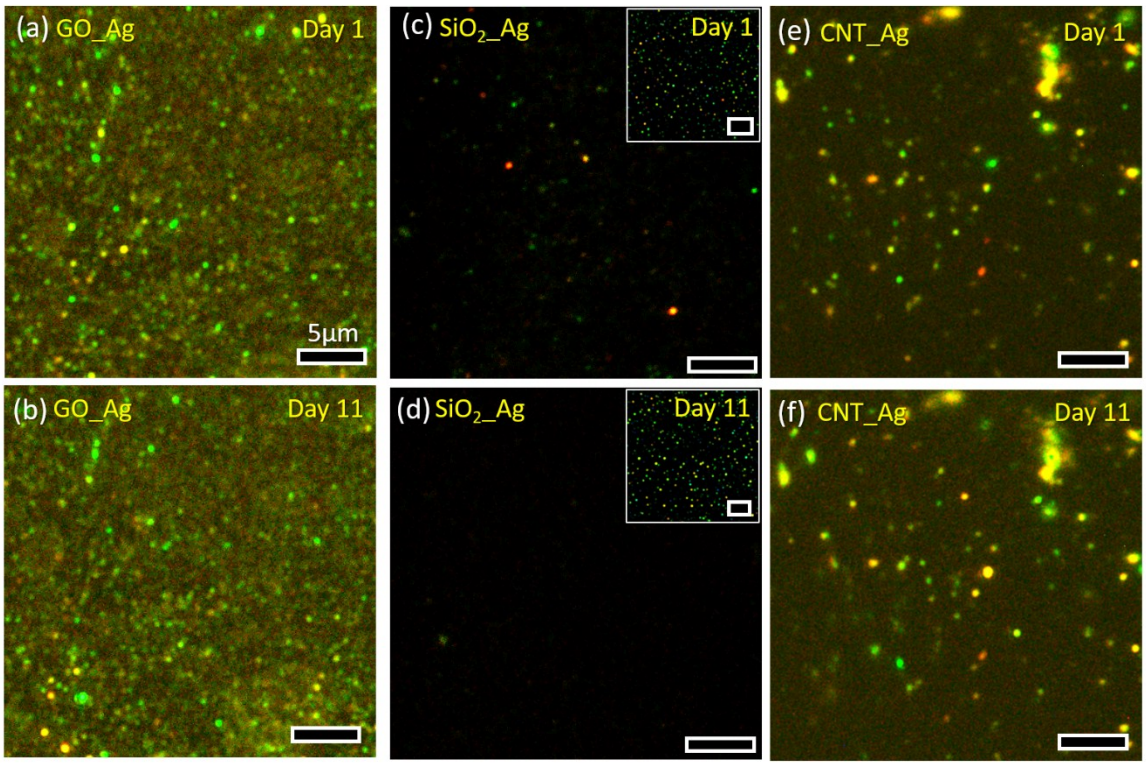

Figure S5. FM images of AgNPs on (a-b) GO, (c,d) Oxygen etched SiO_2 wafer. Insets show the dark field image of the sample showing the presence of nanoparticles but they are not blinking as actively and (e-f) CNTs. The images were taken during (a, c, e) day 1 and (b, d, f) day 11. All images are taken under blue excitation (450-500nm).

S6. Successful transfer of Ag NPs from patterned GO film onto flexible PDMS substrates.

Successful transfer of Ag NPs from patterned GO film onto flexible PDMS substrates. Figure S6 shows mirror image of the original Ag NPs patterned on GO film (Figure S6(a)) and the transfer Ag NPs pattern onto flexible PDMS substrate (Figure S6(b)). FM images under BF and blue (450-500 nm) excitation of both pre- (Figure S6(c)-(d)) and post-transferred (Figure S6(e)-(f)) AgNPs show preservation of the tricoloured blinking behaviour after the transfer process.

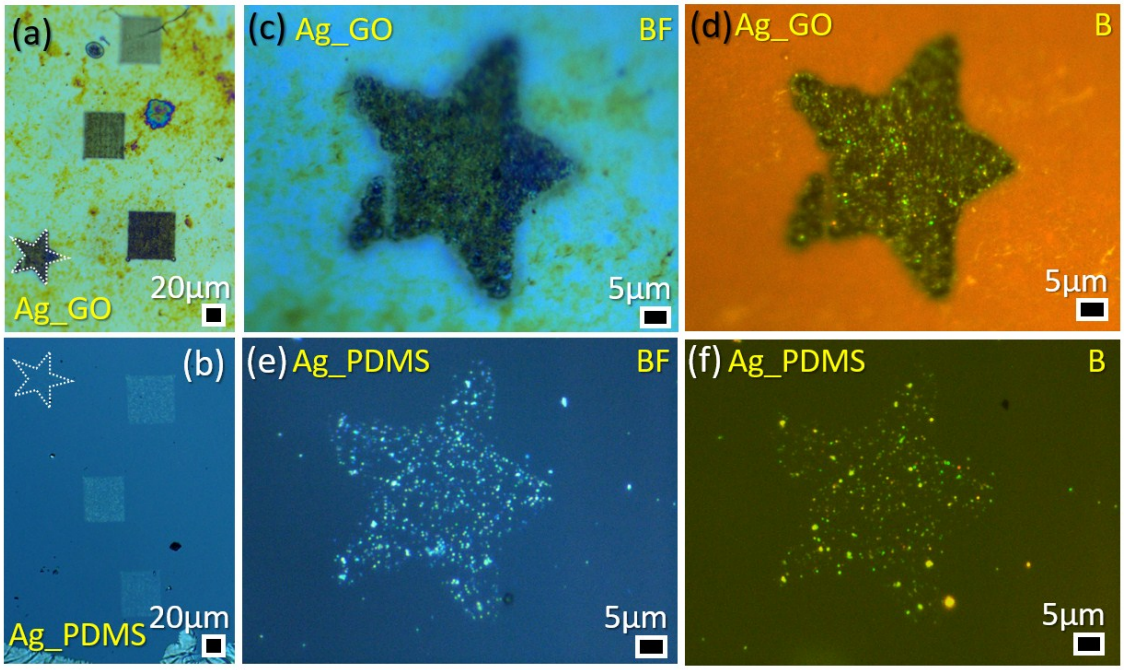

Figure S6. Optical images of (a) original AgNPs on GO and (b) transferred AgNPs on PDMS. FM images of AgNPs remaining on GO and PDMS under (c, e) BF and (d, f) B excitation.