

Supporting Information

# Multifunctional Random Laser Smart Inks

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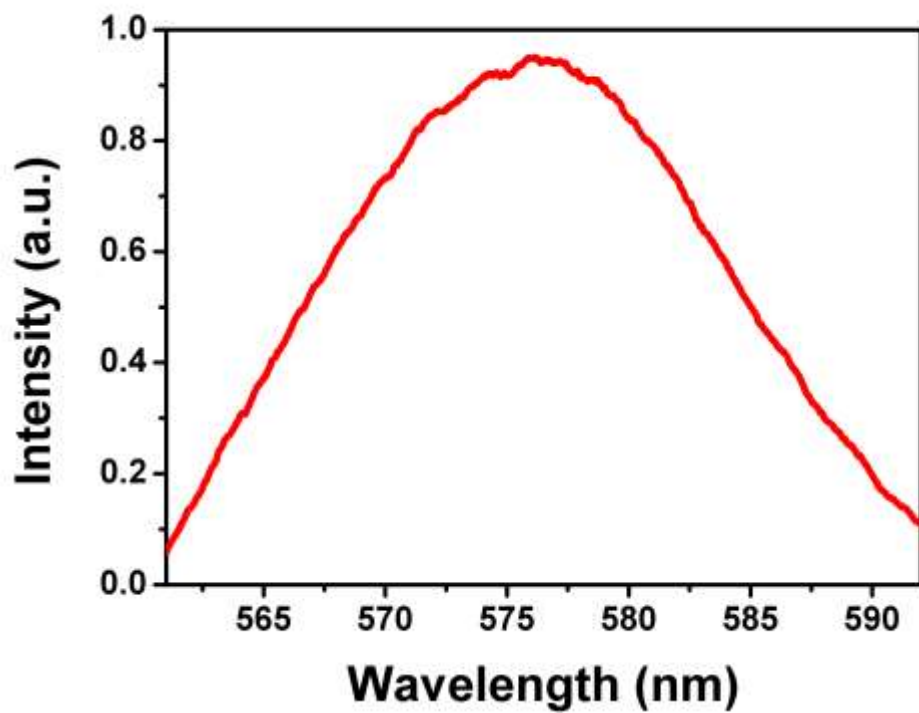
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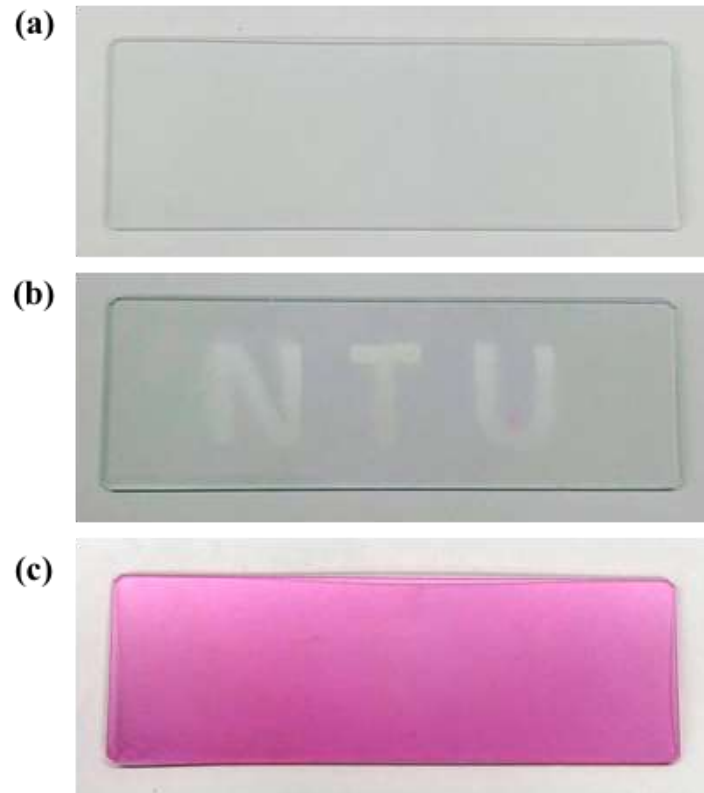
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202, Taiwan

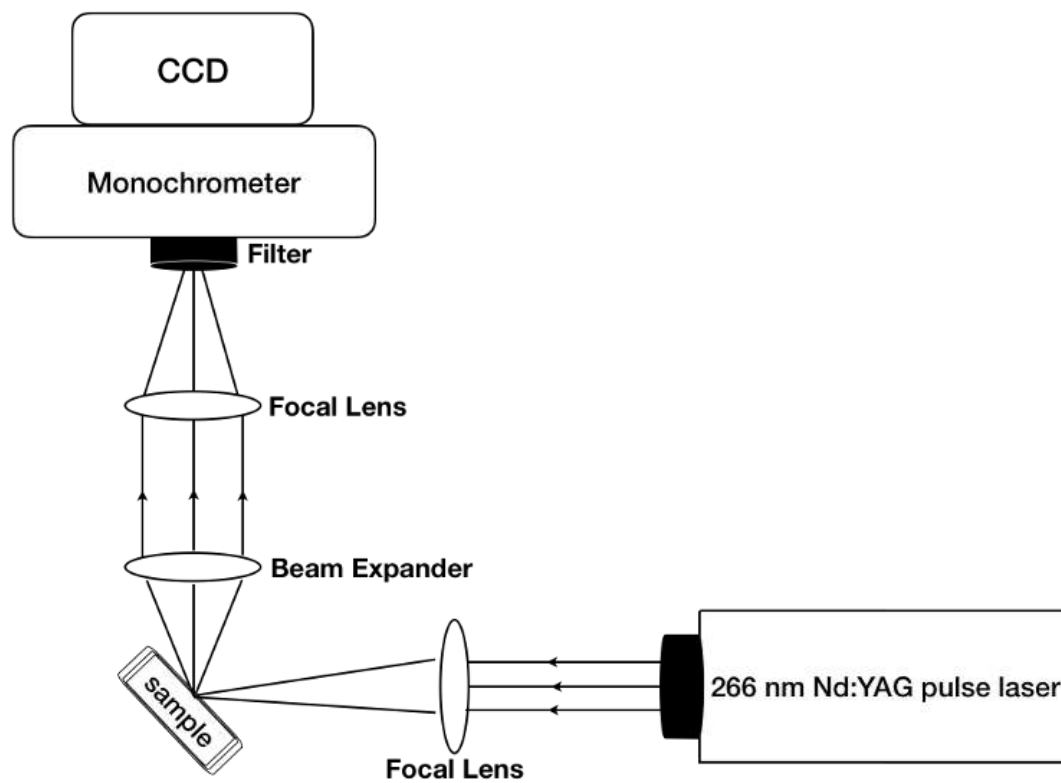
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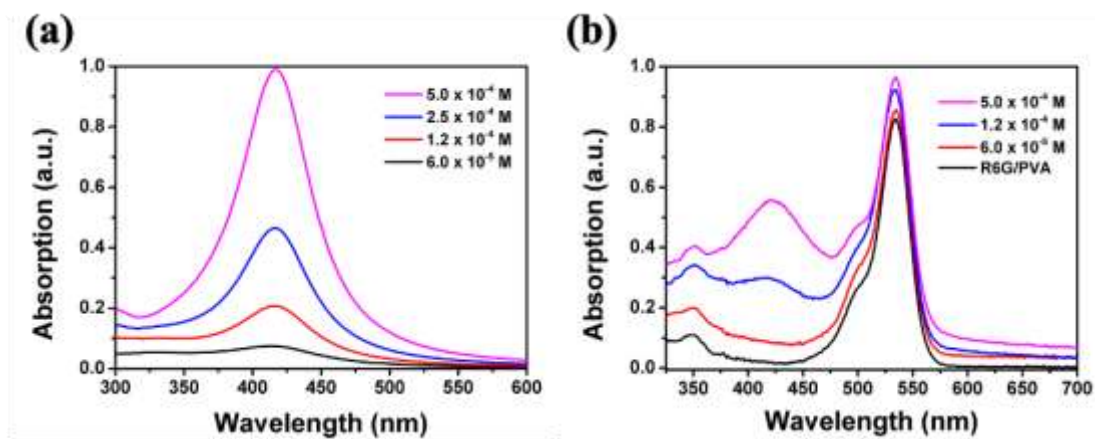
**Figure S1.** The emission spectrum of bare R6G. The peak intensity is approximately located at 575 nm.



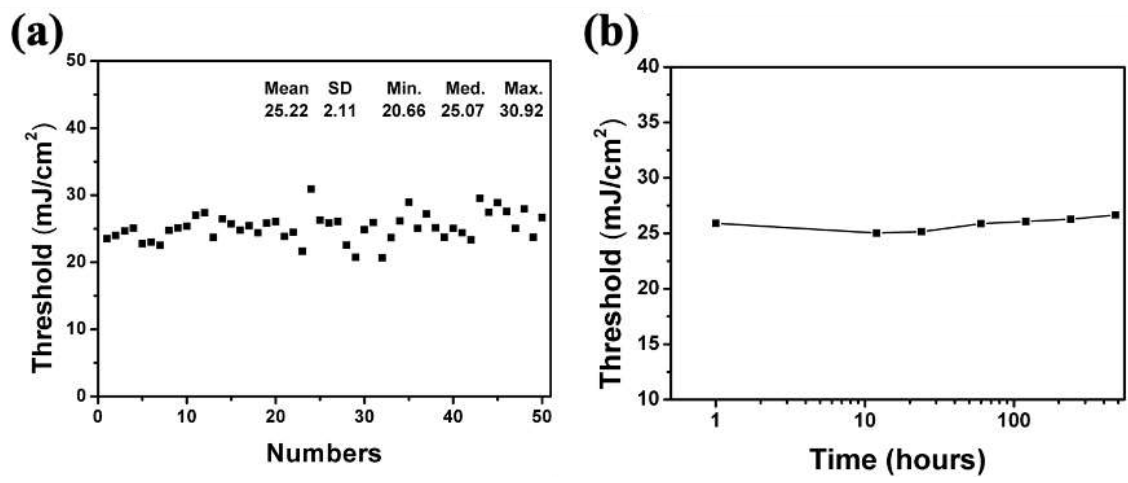
**Figure S2.** The step-by-step fabrication process of the sample. (a) The substrate. (b) After coating Ag NPs-PVA by an “NTU-shaped” mask. (c) After coating a whole layer of R6G-PVA.



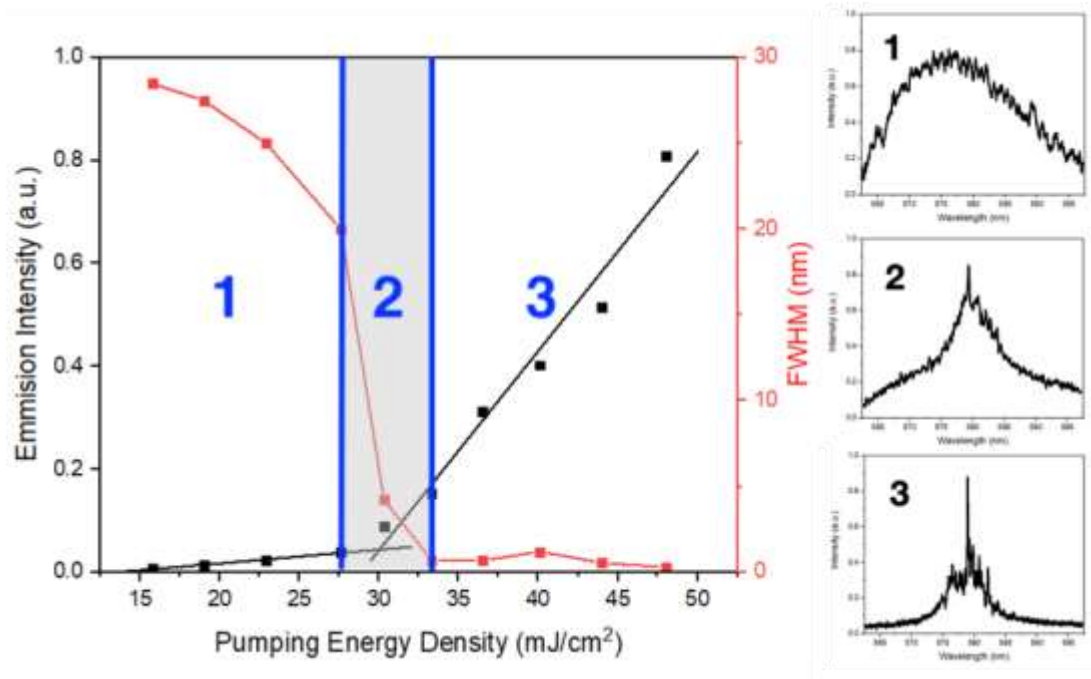
**Figure S3.** The configuration of the optical measurement.



**Figure S4.** The absorption spectrum of PVA-Ag NPs and the absorption spectrum of PVA-R6G-Ag NPs. (a) The absorption spectrum of PVA-Ag NPs films with different concentrations of  $\text{AgNO}_3$ . (b) The absorption spectrum of the PVA-R6G-Ag NPs films with different concentrations of  $\text{AgNO}_3$ .



**Figure S5.** Measurements of the threshold stability. (a) The threshold values of 50 samples with fixed concentration of AgNO<sub>3</sub> and R6G. (b) The threshold values of a single sample stored in the air for different period of time.

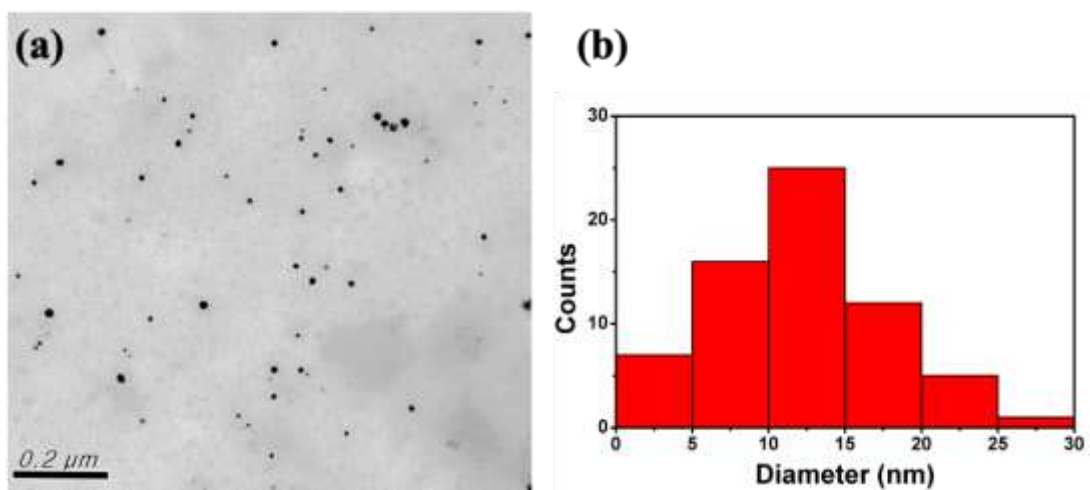


**Figure S6.** The schematic diagram for the three-step change of the FWHM and the corresponding three spectral shapes. The FWHM is around 20 ~ 30 nm (below the threshold); 5 ~ 10 nm (near the threshold); less than 1 nm (above the threshold).

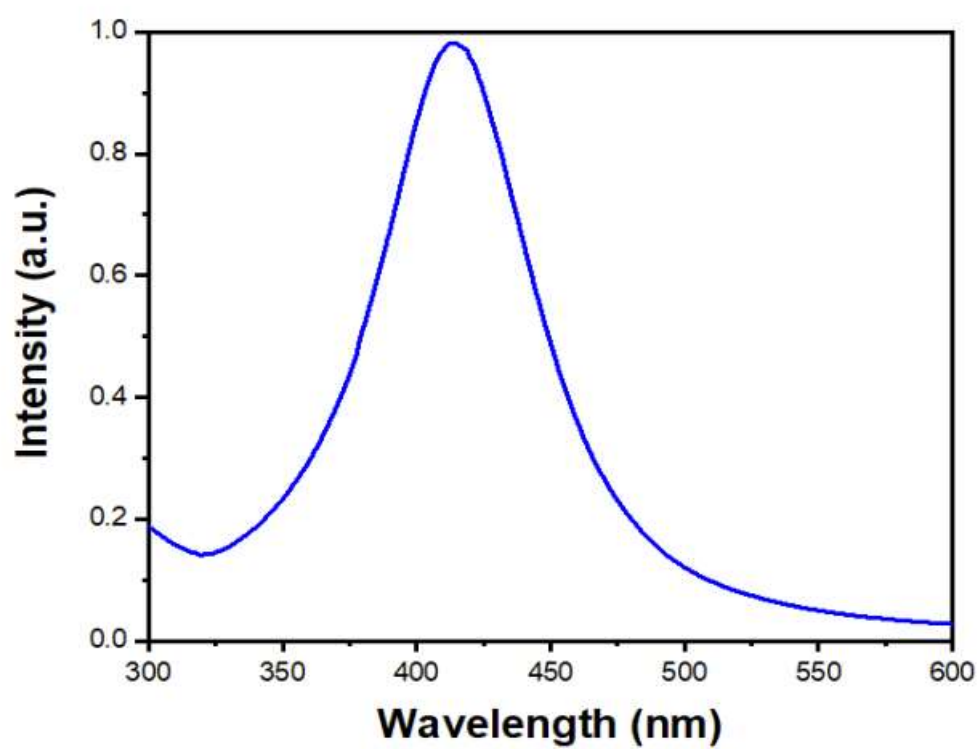


**Figure S7.** The pictures for the ink on three different materials.





**Figure S8.** The TEM image and the size distribution of the Ag NPs. (a) The TEM image of the Ag NPs. (b) The size distribution of the Ag NPs.



**Figure S9.** The extinction spectrum of the standard PVA-Ag NPs polymer film.

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