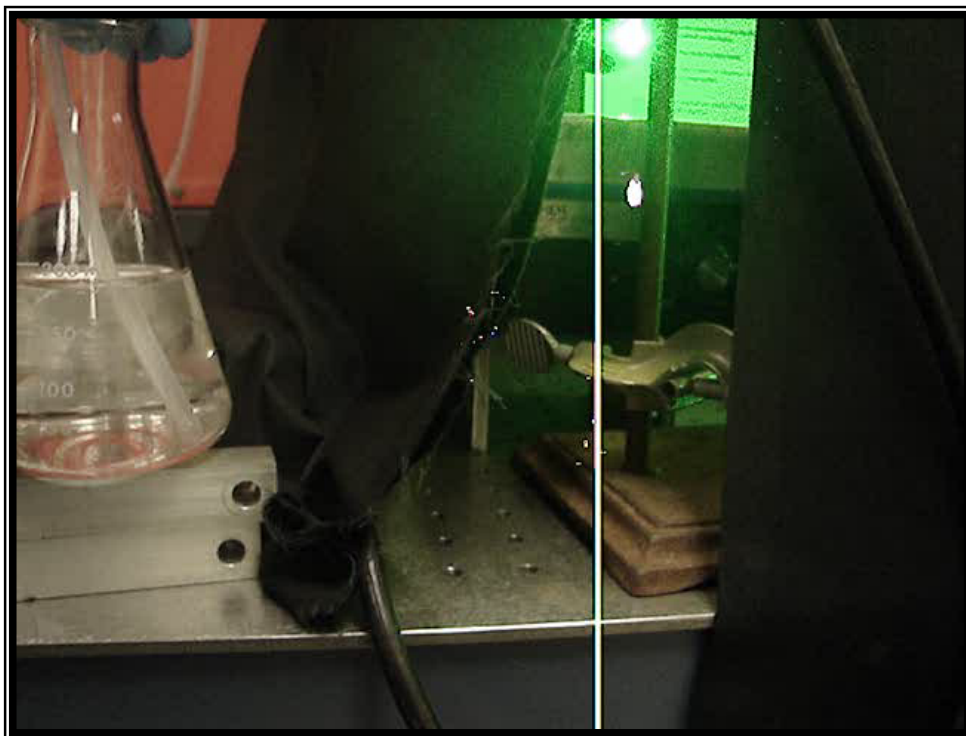


# Laser Assisted Photocatalytic Reduction of Metal Ions by Graphene Oxide

Sherif Moussa, Garrett Atkinson and M. Samy El-Shall\*  
Department of Chemistry, Virginia Commonwealth University, Richmond, VA, 23284

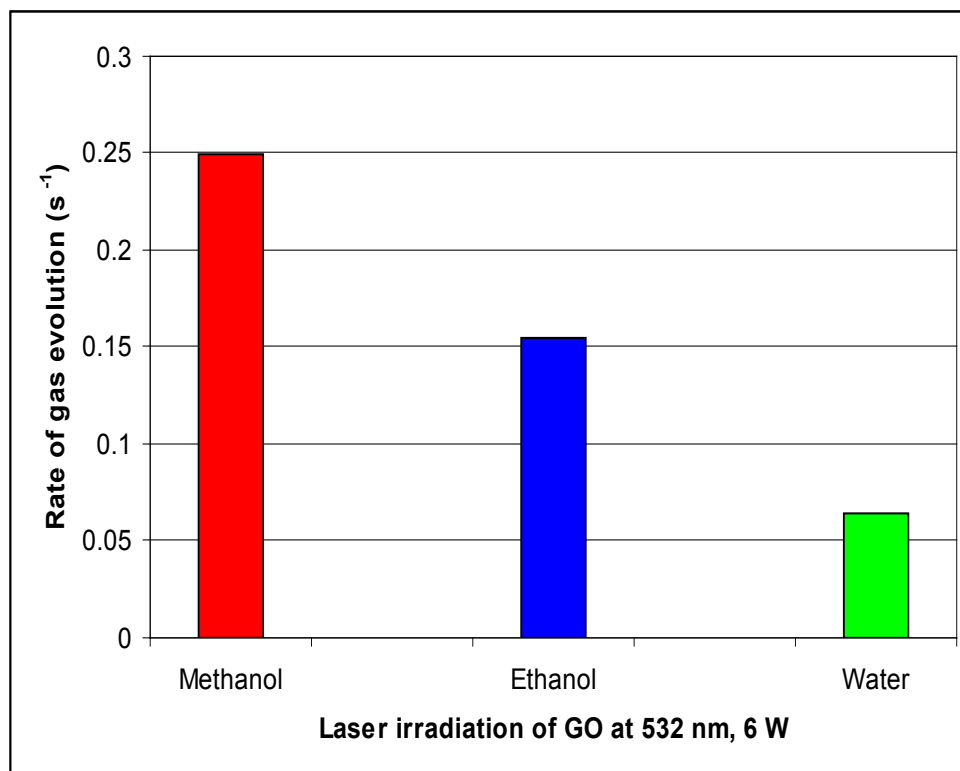
Ahmed Shehata<sup>a</sup>, Khaled M. AbouZeid<sup>a</sup> and Mona B. Mohamed<sup>a,b</sup>  
a) NanoTech Egypt for Photoelectronics, Dreamland, October City, Egypt  
b) National Institute of Laser Enhanced Science, Cairo University, Cairo, Egypt

## **Supporting Information**

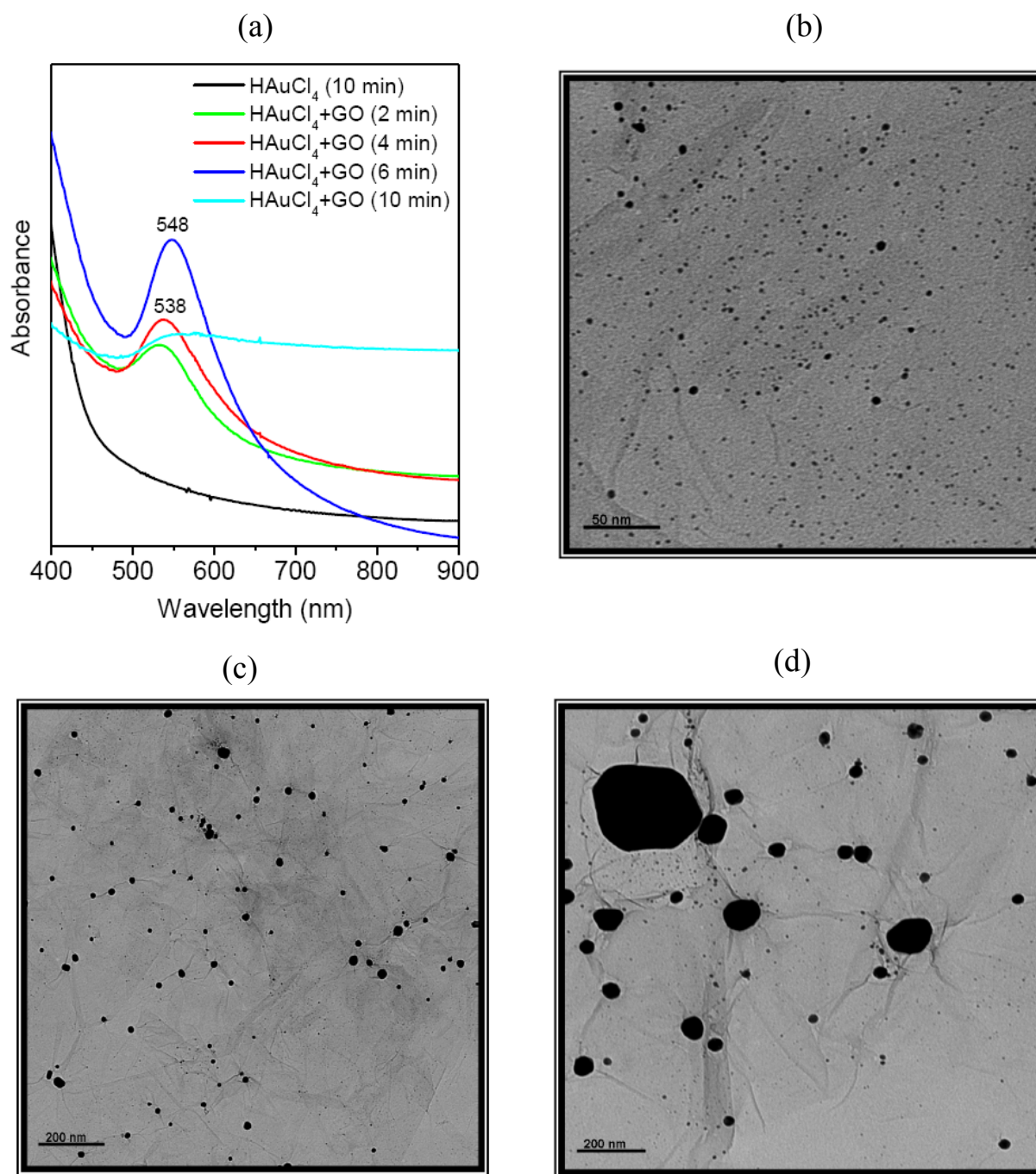


**Figure S1.** Movie illustrating the evolution of H<sub>2</sub>-gas bubbles during the laser irradiation (532 nm, 30 Hz, 5W)

*In order to download movie, please, place the mouse on the image and (CTRL+ click to follow link), you will be directed to the website where the movie can be downloaded.*

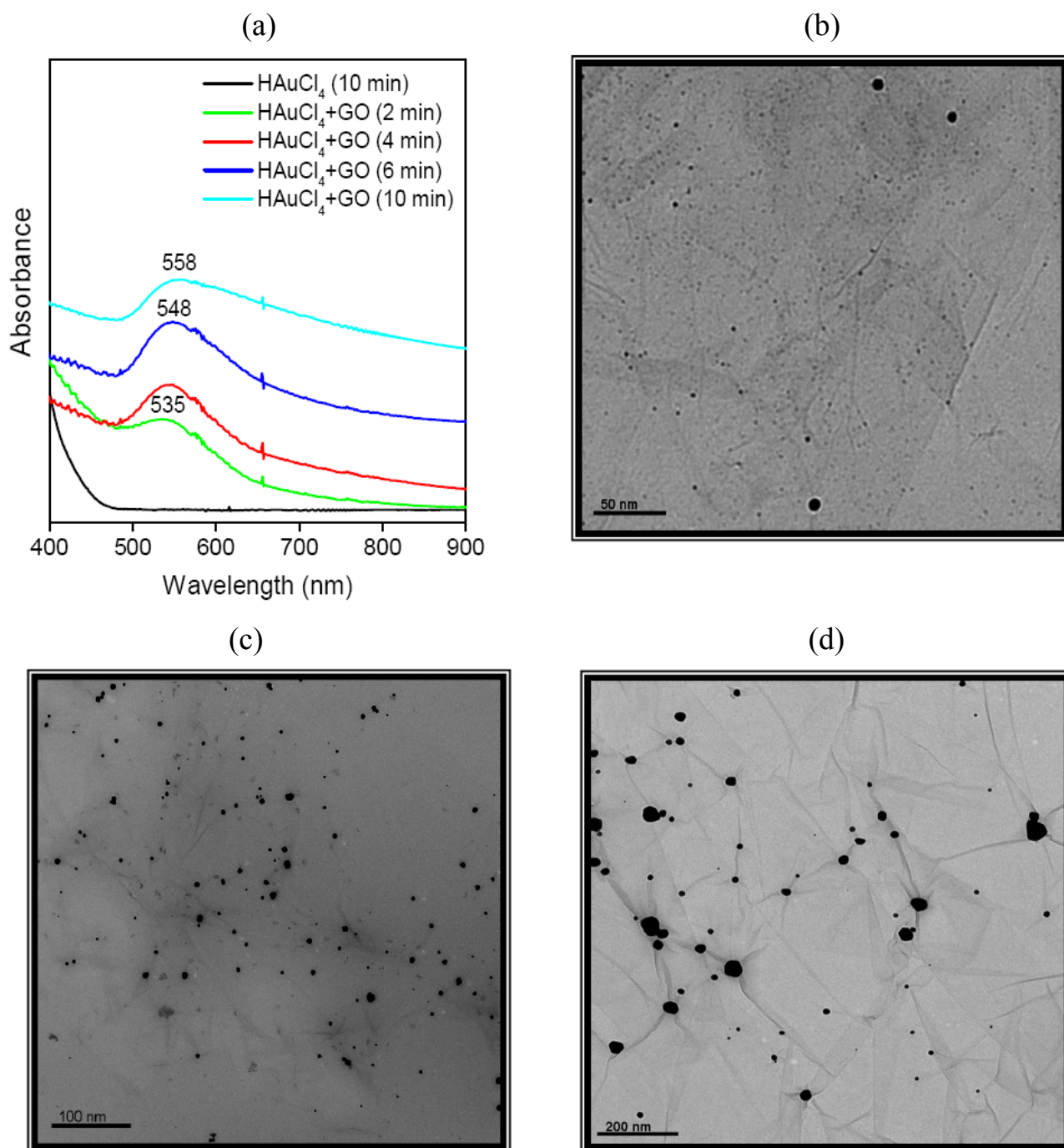


**Figure S2.** Rate of gas evolution during the 532 nm laser irradiation of GO in different solvents: Red (50 vol % methanol-water), Blue: (50 vol % ethanol-water), and Green (pure water).



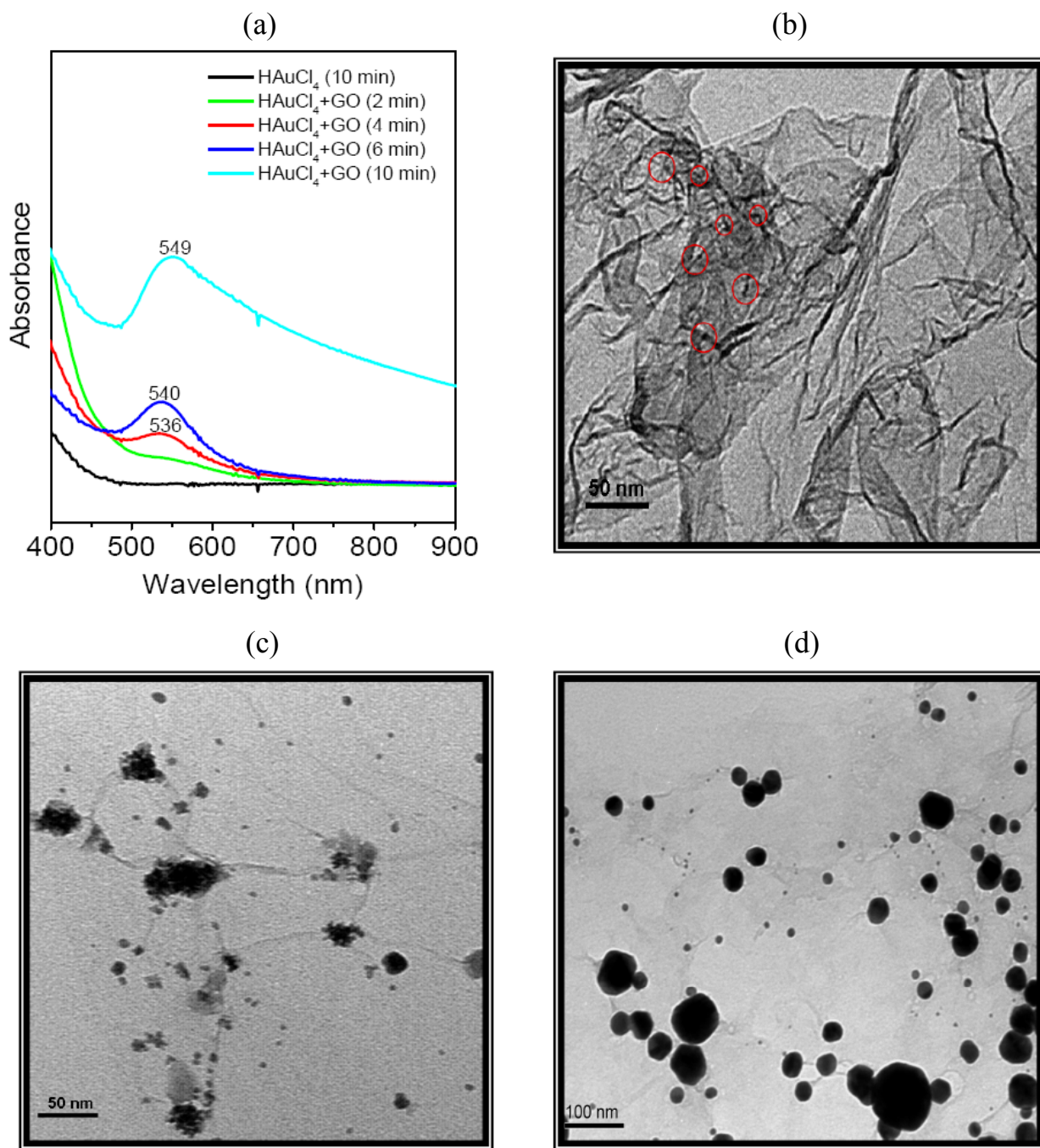
**Figure S3. (a)** Absorption spectra of HAuCl<sub>4</sub> + GO in a 50% ethanol-water mixture recorded following the 532 nm laser irradiation (4W, 30 Hz) for different times as indicated. The solution contains 25 μL HAuCl<sub>4</sub> in 3 mL ethanol-water. The GO concentration is 2 mg GO in 10 mL ethanol-water.

**(b), (c) and (d):** TEM images of the Au nanoparticles-GO nanocomposites obtained after irradiation for 2, 4 and 10 minutes, respectively.



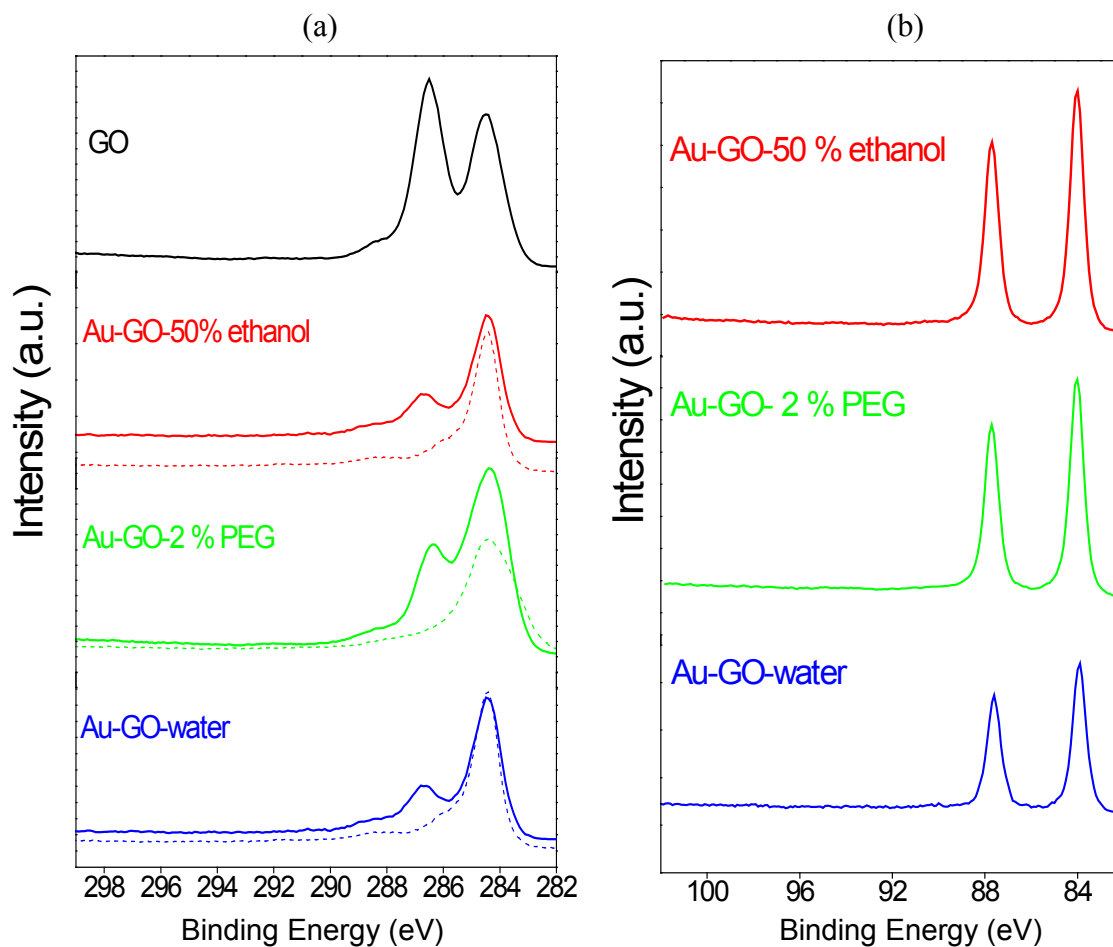
**Figure S4.** (a) Absorption spectra of HAuCl<sub>4</sub>+ GO in a 2% PEG-water mixture recorded following the 532 nm laser irradiation (4W, 30 Hz) for different times as indicated. The solution contains 25 µL HAuCl<sub>4</sub> in 3 mL PEG-water. The GO concentration is 2 mg GO in 10 mL PEG-water.

**(b), (c) and (d):** TEM images of the Au nanoparticles-GO nanocomposites obtained after irradiation for 2, 4 and 6 minutes, respectively.



**Figure S5. (a)** Absorption spectra of HAuCl<sub>4</sub>+ GO in water recorded following the 532 nm laser irradiation (4W, 30 Hz) for different times as indicated. The solution contains 25 μL HAuCl<sub>4</sub> in 3 mL water. The GO concentration is 2 mg GO in 10 mL PEG-water.

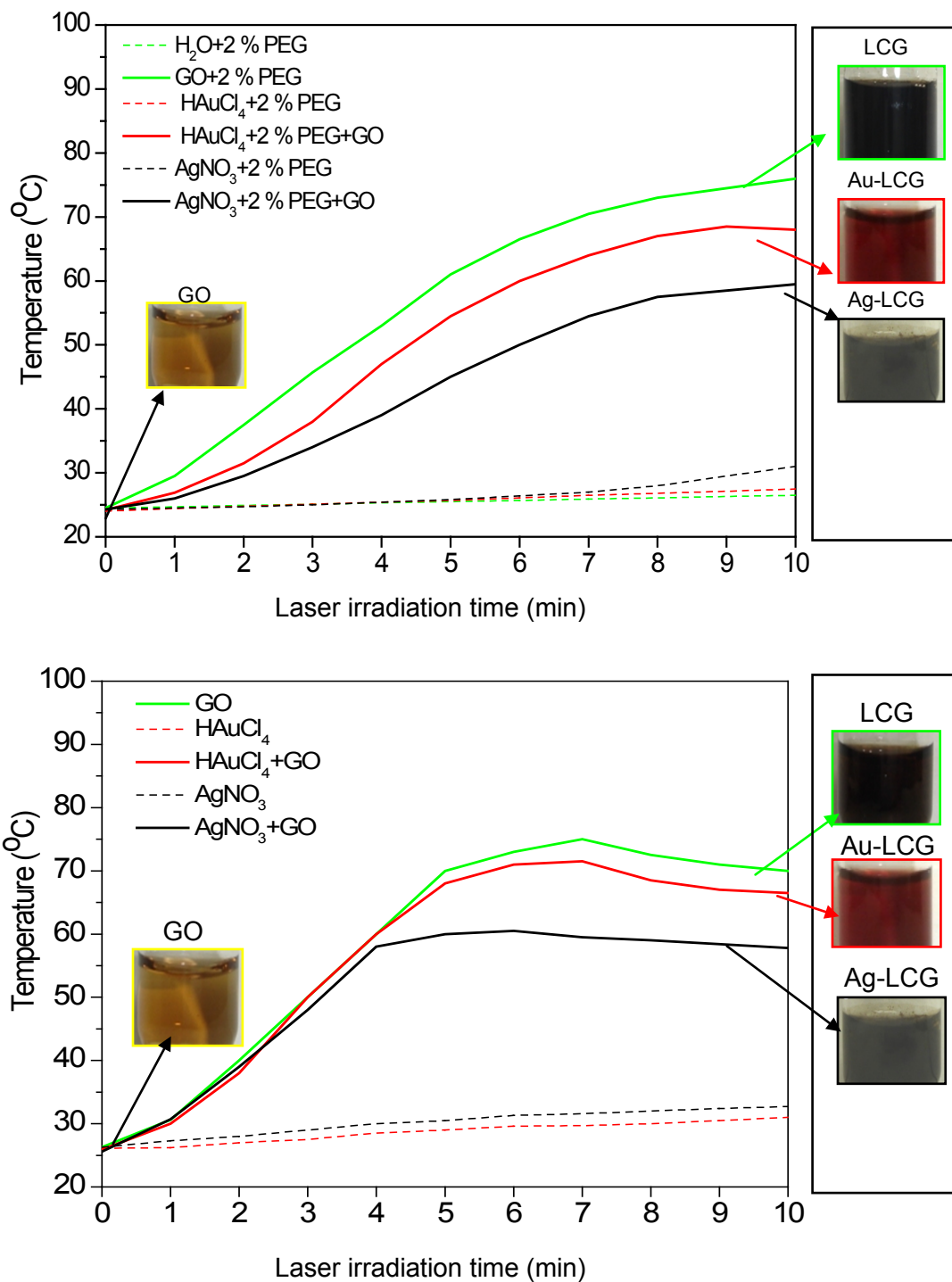
**(b), (c) and (d):** TEM images of the Au nanoparticles-GO nanocomposites obtained after irradiation for 2, 4 and 10 minutes, respectively.



**Figure S6.**

(a) XPS (C1s) spectra of GO and partially reduced GO containing Au nanoparticles prepared after 10 minutes laser irradiation (532 nm, 4 W, 30 Hz) of  $\text{HAuCl}_4$  – GO solutions in different solvents as indicated. Dotted spectra represent the laser-converted graphene (LCG) prepared by 532 nm laser irradiation (4 W, 30 Hz) of GO for 10 minutes in different solvents in the absence of Au ions.

(b) XPS (Au 4f) spectra of Au nanoparticles incorporated in partially reduced GO prepared in different solvents as indicated.



**Figure S7.** (Top) Temperature changes during laser irradiation (532 nm, 4 W, 30 Hz) of GO solutions (3 mL solution, 2 mg GO/10 mL 2% PEG-water) containing H<sub>AuCl</sub><sub>4</sub> and AgNO<sub>3</sub>. Comparisons with the H<sub>AuCl</sub><sub>4</sub> and AgNO<sub>3</sub> solutions without GO under identical laser irradiation conditions are shown. (Bottom) Temperature changes during laser irradiation (532 nm, 5 W, 30 Hz) of GO solutions (3 mL solution, 2mg GO/10 mL water) containing H<sub>AuCl</sub><sub>4</sub> and AgNO<sub>3</sub>. Comparisons with the H<sub>AuCl</sub><sub>4</sub> and AgNO<sub>3</sub> solutions without GO under identical laser irradiation conditions are shown.