Electronic Supplementary Material (ESI) for Catalysis Science & Technology

Supplementary Information

Reduction of Resazurin to Resorufin Catalyzed by Gold Nanoparticles: Dramatic Reaction acceleration by Laser or LED Plasmon Excitation

Carlos J. Bueno Alejo, Chiara Fasciani, Michel Grenier, José Carlos Netto-Ferreira and Juan C. Scaiano

Center for Catalysis Research and Innovation, Department of Chemistry, University of Ottawa, 10 Marie Curie, Ottawa, K1N6N5, ON, Canada.
Departamento de Química, Universidade Federal Rural do Rio de Janeiro, Seropédica, 23851-970, Rio de Janeiro, Brazil.

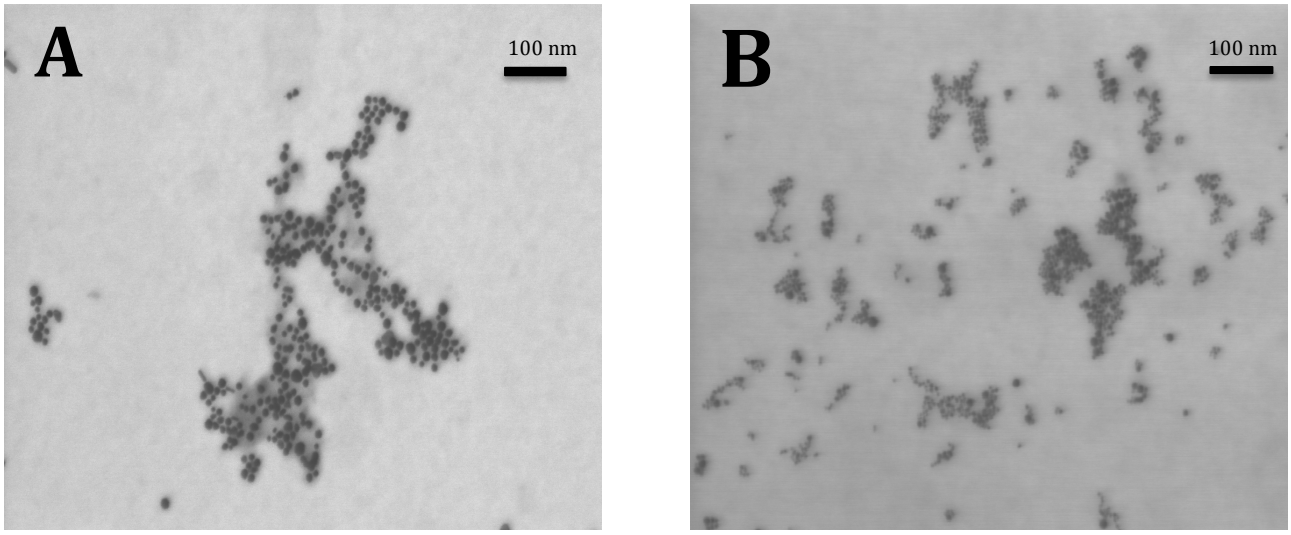

Figure S1. SEM pictures of AuNP before (A) and after (B) laser drop irradiation (1 s/d).

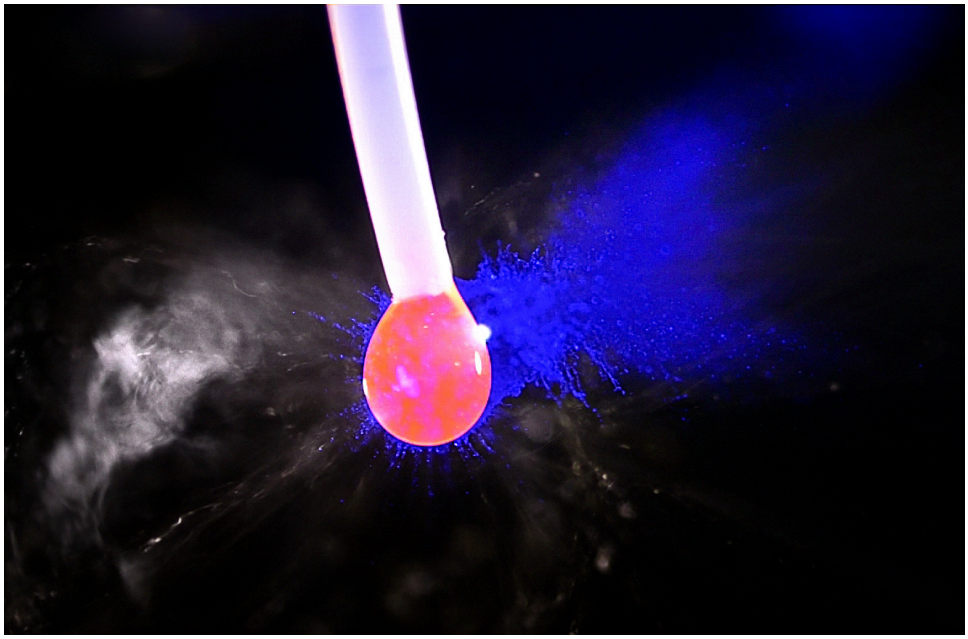

Figure S2. Picture of a drop of solution in the early stages of its explosion after one shot with the laser beam concentrated and focused in the drop.

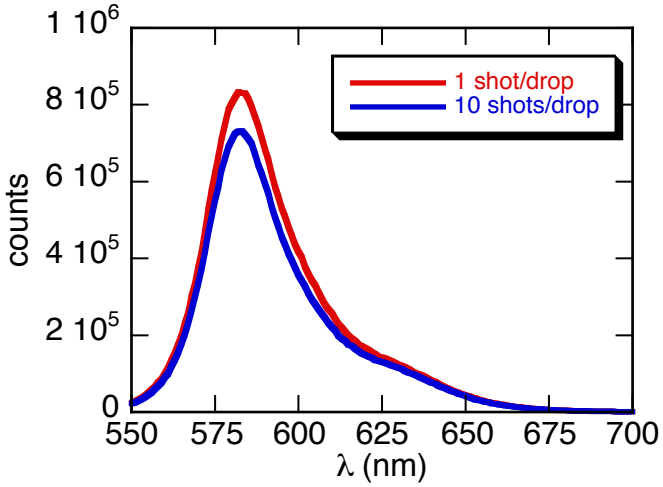

Figure S3. Fluorescence spectra from the experiment using different shots/drop. Conditions: Resazurine 1mM, NH_2OH 2 mM and AuNP 1.4 nM. Laser pulse energie 50 mJ.

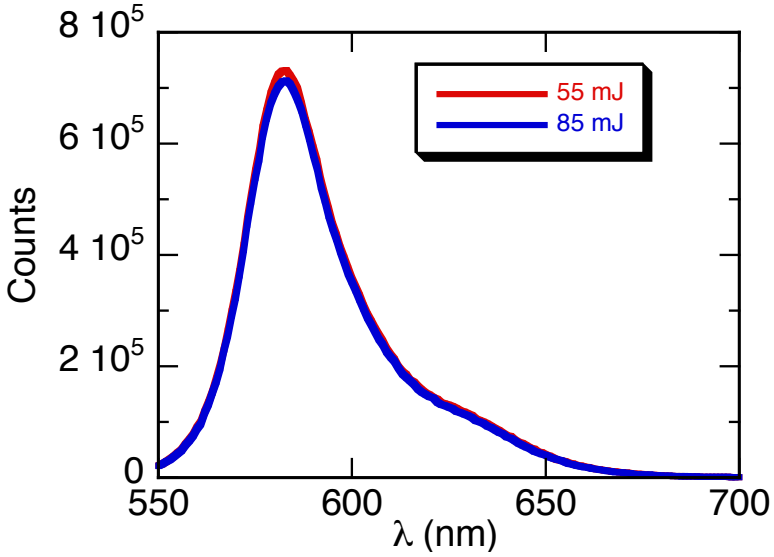

Figure S4. Fluorescence spectra from the experiment using different laser pulse energies. Conditions: Resazurine 1mM, NH_2OH 2 mM and AuNP 1.4 nM; 1 shot/drop.

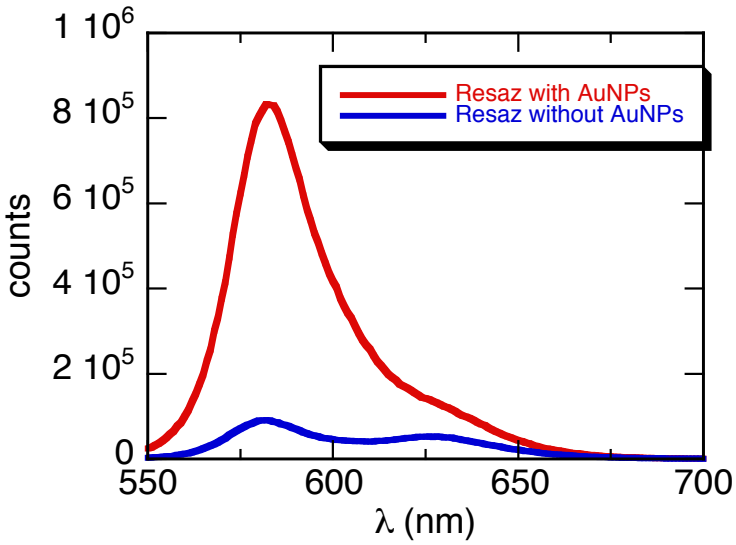

Figure S5. Fluorescence spectra from the experiment in the presence and absence of AuNPs. Conditions: Resazurine 1mM, NH_2OH 2 mM and AuNP 1.4 nM. Laser pulse energy 50 mJ and 1 shot/drop.

Absorption spectra for reagents and products at the concentrations used.

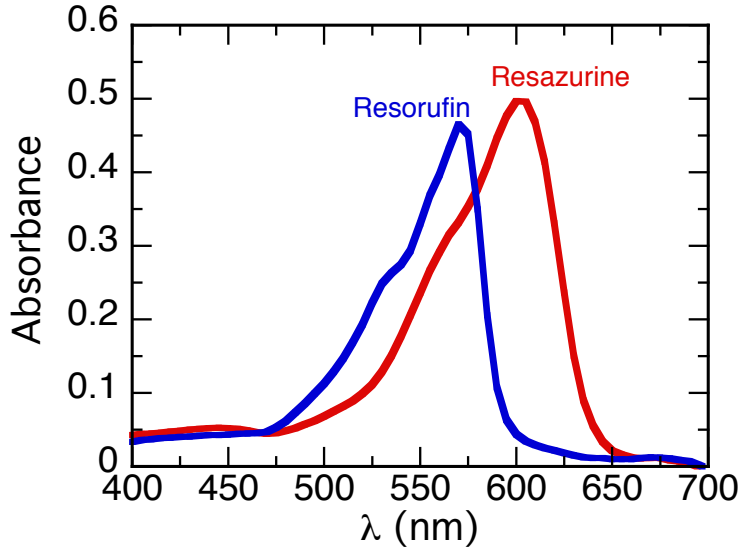

Figure S6. Absorption spectra of Resazurin and resorufin at 0.001 mM concentration.

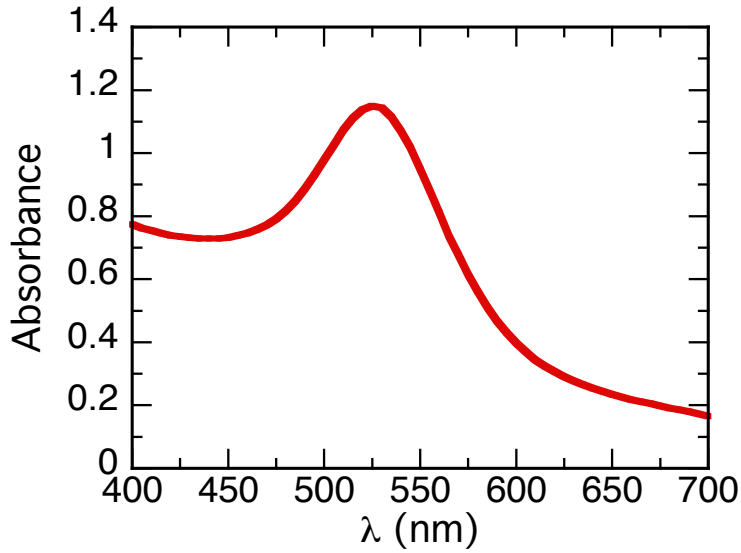

Figure S7. Absorption spectra of AuNP at 1.4 nM concentration.

Attempted reduction with triethylamine

Given that amines are known reducing agents, we tested the effect of triethylamine in comparison with NH_2OH. This is illustrated in Figures S8 and S9.

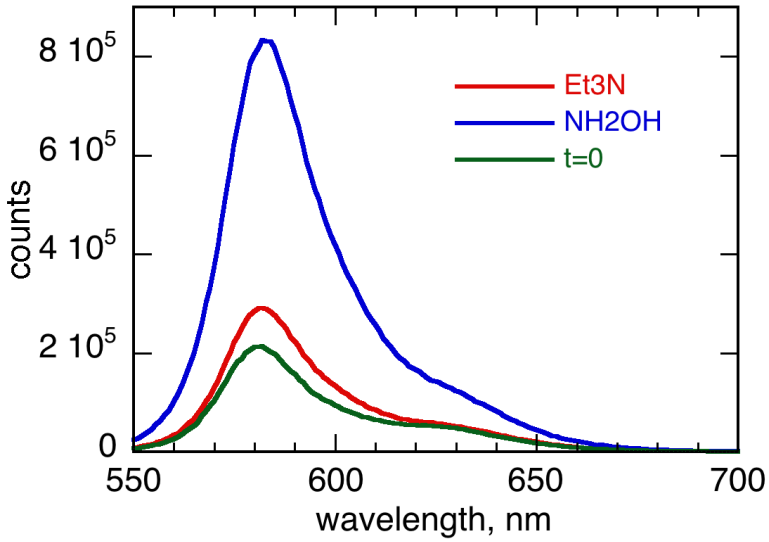

Figure S8. Fluorescence spectra from the experiment in the presence of Et_3N and NH_2OH. Conditions: Resazurine 1mM, NH_2OH or Et_3N 2 mM and AuNP 1.4 nM. Laser pulse energy 50 mJ and 1 shot/drop.

A quenching experiment was performed with Resorufin to test if the lack of fluorescence enhancement could be due to fluorescence quenching by triethylamine. This is shown in Figure S9, confirming that at the concentrations used the lack of fluorescence enhancement is not due to amine quenching.

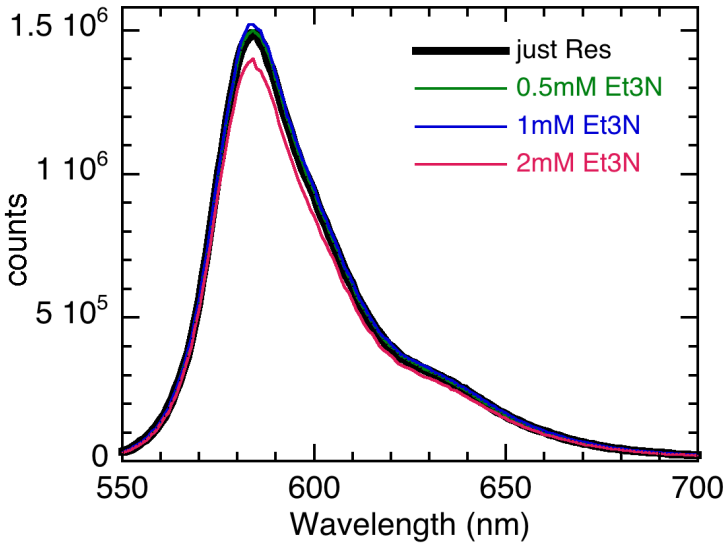

Figure S9. Resorufin (1mM) fluorescence in water with λ_{ex} 532 nm. Note that triethylamine at up to 2 mM concentration has essentially no effect on the fluorescence intensity.