

Supplementary Material

Quenching of the photoluminescence of gold nanoclusters synthesized by pulsed laser ablation in water upon interaction with toxic metal specie in aqueous solution

Tahir^{1*}, Fernando Lazaro Freire Jr.¹, Ricardo Q. Aucelio², Marco Cremona¹, Juliana da S. Padilha², Giancarlo Margheri³, Quaid Zaman^{1,4}, Guilherme C. Concas¹, Mariana Gisbert¹, Sajjad Ali⁵, Carlos A.T. Toloza^{2,6}, Yordy E. Licea⁷⁻⁸, Tatiana D. Saint'Pierre², Rafael S. Carvalho¹, Rajwali Khan⁹, Gino Mariotto¹⁰, Nicola Daldosso¹⁰, Geronimo Perez¹¹ and Tommaso Del Rosso^{1*}

¹ Department of Physics, Pontifícia Universidade Católica do Rio de Janeiro, Rua Marques de São Vicente, 22451-900 Rio de Janeiro, Brazil

² Department of Chemistry, Pontifícia Universidade Católica do Rio de Janeiro, Rua Marques de São Vicente, 22451-900 Rio de Janeiro, Brazil

³ CNR - National Research Council of Italy - Istituto dei Sistemi Complessi, Via Madonna del Piano 10, 50019 Sesto Fiorentino, Italy

⁴ Department of Physics, University of Buner, Buner, 17290, Pakistan

⁵ Yangtze Delta Region Institute (Huzhou), University of Electronic Science and Technology of China, Huzhou 313001, China

⁶ Department of Natural and Exact Sciences, Universidad de la Costa, Barranquilla, Colombia

⁷ Centro Brasileiro de Pesquisas Físicas (CBPF), COMAN/CBPF, Rua Dr. Xavier Sigaud, 150, Urca, 22290-180 Rio de Janeiro-RJ, Brazil

⁸ GSK Biopharma, 9910 Belward Campus Dr, Rockville, MD 20850, USA

⁹ Department of Physics, University of Lakki Marwat, Pakistan

¹⁰ Department of Informatics, Università di Verona, Strada le Grazie 15, I-37134 Verona, Italy

¹¹ Department of Mechanical Engineering, Universidade Federal Fluminense, Rua Passo da Pátrias, 156, CEP 24210-240 Niteroi, Brazil

* Correspondence: tahirjanqau@gmail.com and tommaso@puc-rio.br

1. Separation of AuNCs by NaCl and dialysis

Figure S1 (a, b, c) shows the steps of the bleaching process of the gold nanomaterial by the addition of NaCl (0.7 mmol L⁻¹) followed by dialysis.

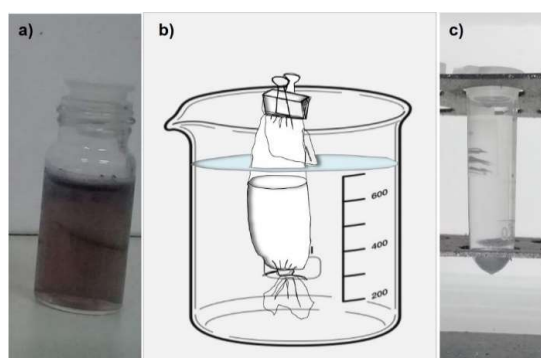


Figure S1. Photos demonstrating the method of bleaching of the gold nanomaterial via agglomeration by NaCl and dialysis. a) The nanomaterial just after putting NaCl. b) Schematic diagram of dialysis of nanomaterial. c) Transparent colloidal dispersion of the photoluminescent AuNCs after dialysis.

2. Luminescence quenching of AuNCs via interaction with HMI

The full emission spectra obtained upon interaction of gold nanocluster (AuNCs) with the HMI are reported in Figure S2 and Figure S3, for both UV and visible emissions, respectively. The concentration of HMI was varied from 10 ppb to 640 ppb for each case.

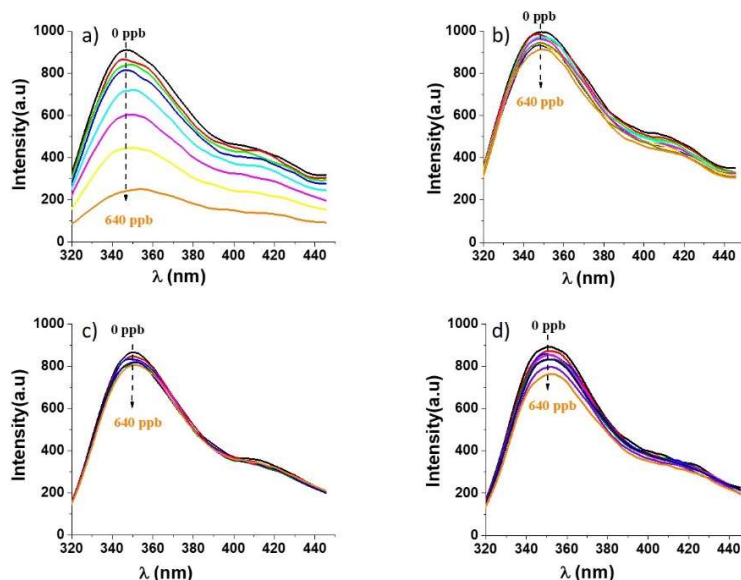


Figure S2. Full emission spectra during the quenching of the photoluminescence of the AuNCs in the ultraviolet (UV) region upon interaction with a) Hg^{2+} , b) Pb^{2+} , c) Cd^{2+} , and d) $\text{CH}_3\text{Hg}^{1+}$.

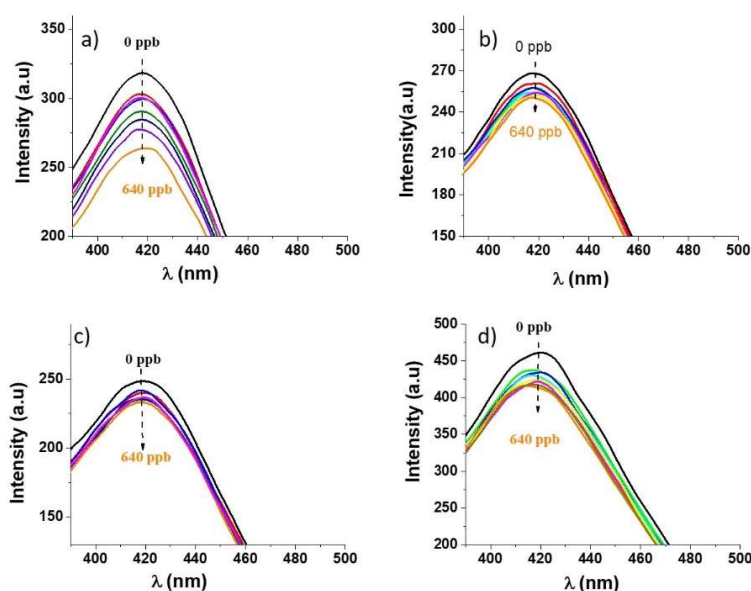


Figure S3. Full emission spectra during the quenching of the photoluminescence of the AuNCs in the visible (blue) region upon interaction with a) Hg^{2+} , b) Pb^{2+} , c) Cd^{2+} , and d) $\text{CH}_3\text{Hg}^{1+}$.

3. Evaluation of the standard deviation

In Figure S4 are reported the emission spectra used for the evaluation of the standard deviation

$\sigma_{I_0/I}$. We measured $\sigma_{I_0/I} = \frac{\sigma}{L_0} \approx 0.013 \ll 1$ for both UV and visible emission.

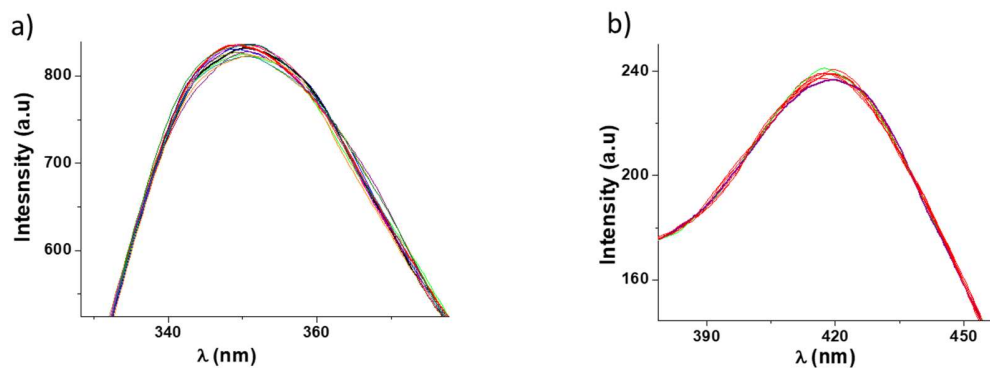


Figure S4. Blank emission spectra (before the injection of the HMI) of the AuNCs used for the determination of the standard deviation $\sigma_{I_0/I}$.