

# Gold and platinum-decorated lithium niobate nanozymes for protection against UV-light induced damage

Ana-María Pablo-Sainz-Ezquerro<sup>1,3</sup>, Florian Riporto<sup>2</sup>, Yannick Mugnier<sup>2</sup>, Pyria Rose Divina Mariathomas<sup>3</sup>, Eric Puzenat<sup>4</sup>, Luis Cardenas<sup>4</sup>, Mimoun Aouine<sup>4</sup>, Christophe Geantet<sup>4</sup>, Rajesh Ramanathan<sup>3</sup>, Vipul Bansal<sup>3</sup>, Yann Chevolut<sup>1</sup>, Virginie Monnier<sup>1\*</sup>

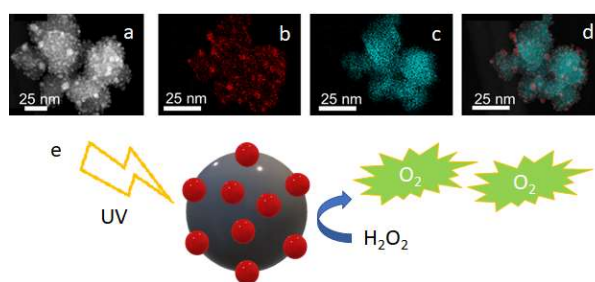
<sup>1</sup> Univ Lyon, Ecole Centrale de Lyon, Institut des Nanotechnologies de Lyon, Ecully, France

<sup>2</sup> Université Savoie Mont Blanc, SYMME, Annecy, France

<sup>3</sup> Sir Ian Potter NanoBioSensing Facility, NanoBiotechnology Research Laboratory, RMIT University, Melbourne, Australia

<sup>4</sup> Univ Lyon, Université Claude Bernard Lyon 1, CNRS, IRCELYON, Villeurbanne, France  
Adresse courriel du présentateur: [virginie.monnier@ec-lyon.fr](mailto:virginie.monnier@ec-lyon.fr)

Nanozymes are a new class of artificial enzymes, that offer great value in terms of price and, especially, allow multi-functionalization due to their tunability in shape, size, type of material, type of coating or even the modulation of their physical properties through external stimuli such as light.<sup>1</sup> Among them, metal Nanozymes are well-established nanomaterials which allow easiness of modification and functionalization. Their outstanding properties in catalysis requires a reduced size, but the risk of aggregation increases. To overcome this, their deposition onto an oxide is a potent approach, which produces a synergetic catalytic effect and generates a hotspot for catalysis. We synthesized noble-metal lithium niobate nanoparticles with branched-polyethyleneimine as an intermediate linker.<sup>2</sup> Au and Pt nanoseeds were deposited onto LiNbO<sub>3</sub>. Then we studied their ability to mimic peroxidase activity using a redox probe and we optimized the conditions to maximize the colorimetric response. The hybrid nanoparticles possess better peroxidase-mimics than the separated counterparts and a simple mixture of them.<sup>3</sup> The nanozymes were applied to *Escherichia Coli* culture under different sources of oxidative stress, *i.e.*, hydrogen peroxide and ultraviolet light. The hybrid Nanozymes composed of LiNbO<sub>3</sub>/Au and LiNbO<sub>3</sub>/Pt were found to protect the bacteria from UV-light induced damage.



**Figure 1.** LiNbO<sub>3</sub>/Au Nanozymes characterization. (a) Scanning Transmission Electron Microscopy image. (b-d) Energy-Dispersive X-Ray chemical mapping : (b) Au, (c) Nb, (d) Au+Nb. (e) Scheme of photo-induced catalase leading to a UV protective effect of Nanozymes on bacteria.

## Références:

1. D. Jiang et al, *Chem. Soc. Rev.*, **48**, 3683 (2019).
2. R. Taitt et al, *Nanomaterials*, **11**, 950 (2021).
3. A. M. Pablo Sainz-Ezquerro et al, *ACS Appl. Nano Mater.*, doi: 10.1021/acsnm.3c01901 (2023).