

## Supporting Information

# Photoacoustics for listening to Metal Nanoparticles

## Super-Aggregates

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## Materials

Solvents were purchased from Sigma-Aldrich Co.: Dichloromethane, Chloroform, Ethanol, Toluene. Reagents were purchased from Sigma-Aldrich Co and used without further purification: Silver nitrate ( $\text{AgNO}_3$ ), Tetrabutylammonium bromide (TOAB), Sodium borohydride ( $\text{NaBH}_4$ ), Sodium Sulfate Anhydrous ( $\text{Na}_2\text{SO}_4$ ). *Trans*-bis(triphenylphosphine)Platinum(II) dichloride,<sup>1</sup> 4,4'-diethylbiphenyl,<sup>2</sup> and *trans,trans*-4,4' diethynyl(bis(tributylphosphine)-Pt(II)thioacetyl) biphenyl, (Pt-DEBP) and Silver nanoparticles functionalized with Pt-DEBP were prepared according to our previous studies.<sup>3</sup>

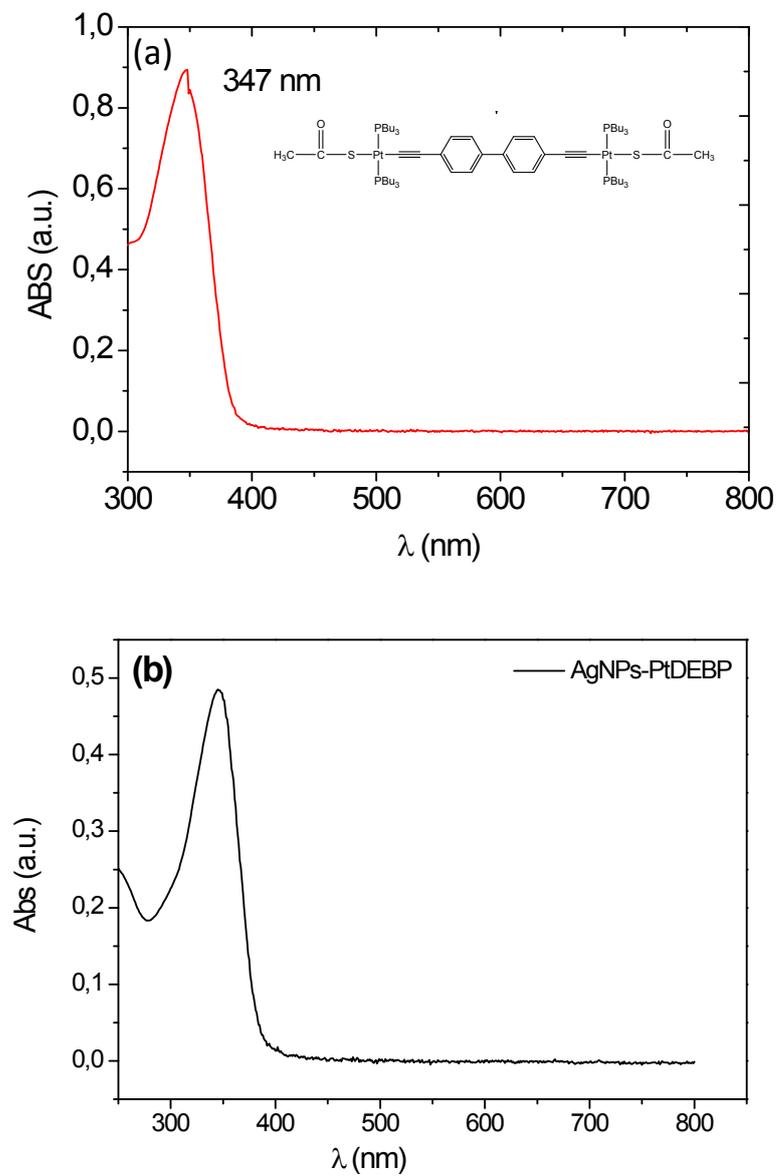
## Synthesis procedure

In brief, AgNPs functionalized with Pt-DEBP used in this work were prepared by using a Ag/Pt-DEBP ligand molar ratio 1.4/1, as follows: 0.0454 g, (0.27 mmol) of  $\text{AgNO}_3$  solved in 4.5 mL of deionized water were mixed with 0.0805 g, (0.147 mmol) of tetrabutylammonium bromide (TOAB), in 10 mL of toluene; after 10 min vigorous mixing, 0.296 (0.382 mmol) of Pt-DEBP solved in 10 mL of toluene and 0.0581 g (1.5 mmol) of sodium borohydride in 5 mL of deionized water were added. The reaction mixture was allowed to react for 2 h at room temperature, then the crude product was recovered by extraction with water/toluene affording a brown suspension of AgNPs (yield 27%wt).

Characterizations: UV-Vis ( $\text{CHCl}_3$ ),  $\lambda_{\text{max}}$  (nm): 420; FTIR (film from  $\text{CH}_2\text{Cl}_2$ ),  $\nu$  ( $\text{cm}^{-1}$ ): 2955, 2927, 2867  $\nu(\text{CH}_2$  and  $\text{CH}_3)$ ; 2120  $\nu(\text{C}\equiv\text{C})$ ; 1622  $\nu(\text{SC}=\text{O})$ , 1600  $\delta(\text{Ar-H})$ ; 1488, 1459, 1261  $\delta(\text{CH}_2$  and  $\text{CH}_3)$ ; FarIR (film from  $\text{CH}_2\text{Cl}_2$ ),  $\nu$  ( $\text{cm}^{-1}$ ): 578 ( $\nu\text{Pt-C}$ ); 460, 396 ( $\nu\text{Pt-P}$ ); 308, 252 ( $\nu\text{Pt-S}$ ); 228 ( $\nu\text{Ag-S}$ ).

## Methods

Fourier transform infrared (FTIR) spectra were recorded as films from  $\text{CH}_2\text{Cl}_2$  solutions using KRS5 (TlBr-TlI) cells with a Bruker Vertex 70 single beam spectrophotometer in the range 4000-400  $\text{cm}^{-1}$ , resolution 4  $\text{cm}^{-1}$ . FarIR spectra were obtained with the same spectrophotometer but using a silicon beam splitter and run under dry  $\text{N}_2$  (100 L/h), 500-200  $\text{cm}^{-1}$  range. UV-Vis spectra were recorded in  $\text{CHCl}_3$  with a Varian Cary 100 spectrophotometer in the 190-900 nm range using quartz cuvettes with optical path length 1 cm, resolution 1 nm. Deionized water, obtained from Zener Power I Scholar-UV (18.4  $\text{M}\Omega\cdot\text{cm}$ ), was degassed for 15 minutes with Argon, before use.



**Fig S 1:** UV-vis Absorption spectrum of Pt-DEBP thiol (a) and of the corresponding AgNPs-Pt-DEBP (b) in CHCl<sub>3</sub> solution. In the inset in fig (a), the drawing of the molecular structure of Pt-DEBP.

## References

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