Supporting Information for

"N-Methyl-2-pyrrolidone as a reaction medium for gold (III) ions reduction and star-like gold nanostructures formation"

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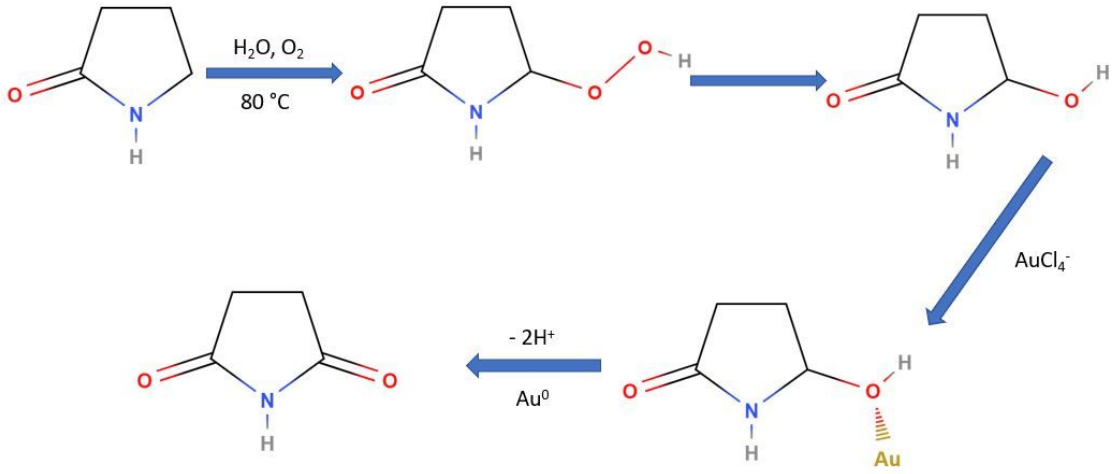
Schemes and Figures:



Scheme S1: Reduction reaction mechanism of gold by 2-pyrrolidinone in the presence of H_2O and O_2.(Adapted from Journal of CrystEngComm 2012, 14 (22), 7549–7551; Li, C. C.; Chen, L. B.; Li, Q. H.; Wang, T. H. Seed-free, aqueous synthesis of gold nanowires. DOI: 10.1039/C2CE25726B, with permission from ROYAL SOCIETY OF CHEMISTRY.)

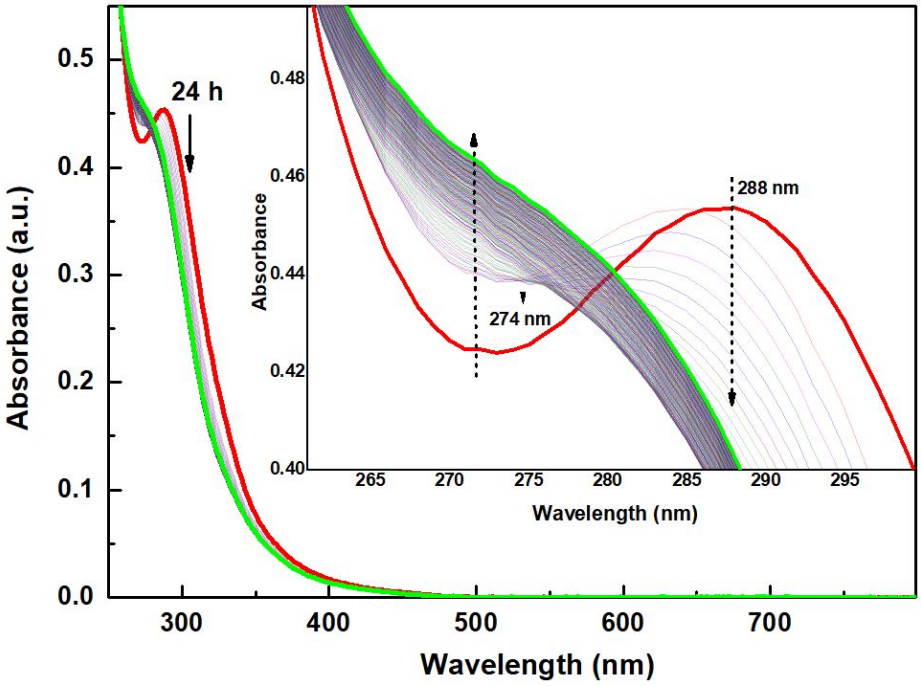


Figure S1: Evaluation of UV-Vis spectra of $HAuCl_4$ at 1.5×10^{-4} M in an aqueous solution during 24h. (optical path: 1 cm, reference: water, time interval: 5 min). Inset: Magnification of spectra in the UV region.

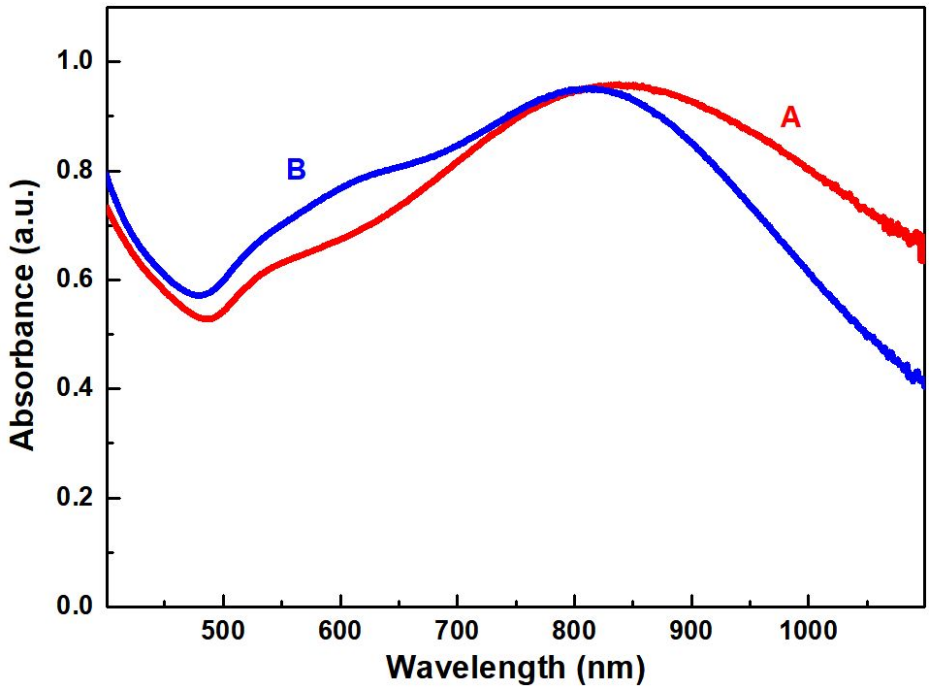
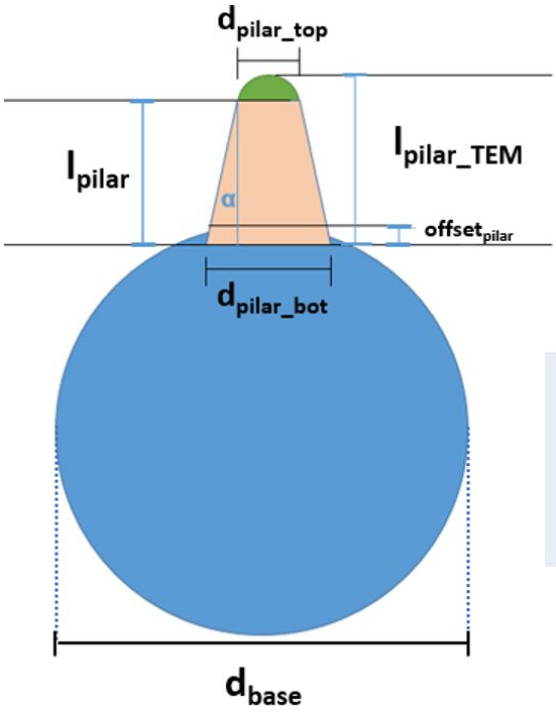


Figure S2: Vis-NIR spectra of AuNPs synthesized under the same experimental conditions by adding 1.25×10^{-4} M of $HAuCl_4$ to the NMP solution containing 7 wt.% (A) and 13 wt.% (B) of PVP after aging for 24h (optical path: 1 cm, reference: NMP).



$$l_{pilar} = l_{pilar\_TEM} - offset_{pilar} - \frac{d_{pilar\_top}}{2}$$

$$d_{pilar_{bot}} = 2\tan(\alpha) \cdot l_{pilar} + d_{pilar\_top}$$

Figure S3: Simplified model considered for the optical spectra and near-field enhancement maps calculations. The dimensions used: α = 5°, d_{base} = 16 nm, l_{pilar_TEM} = 9.0 nm, d_{pilar_top} = 4.5 nm, $offset_{pilar}$ = 1 nm.

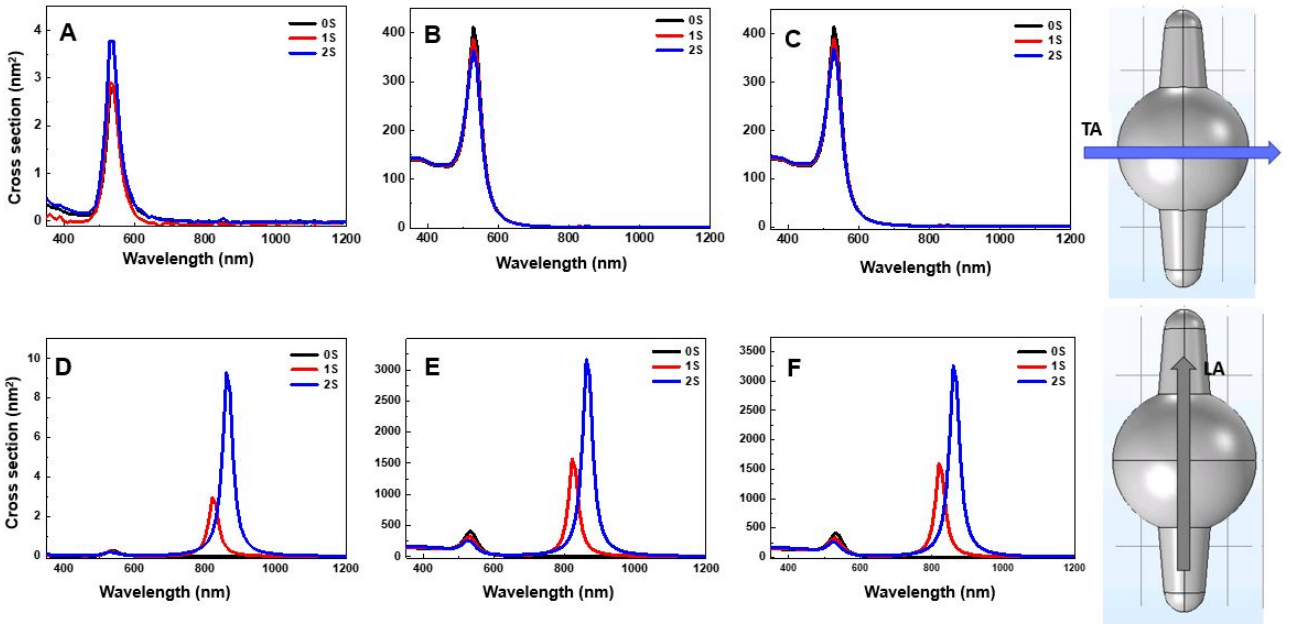
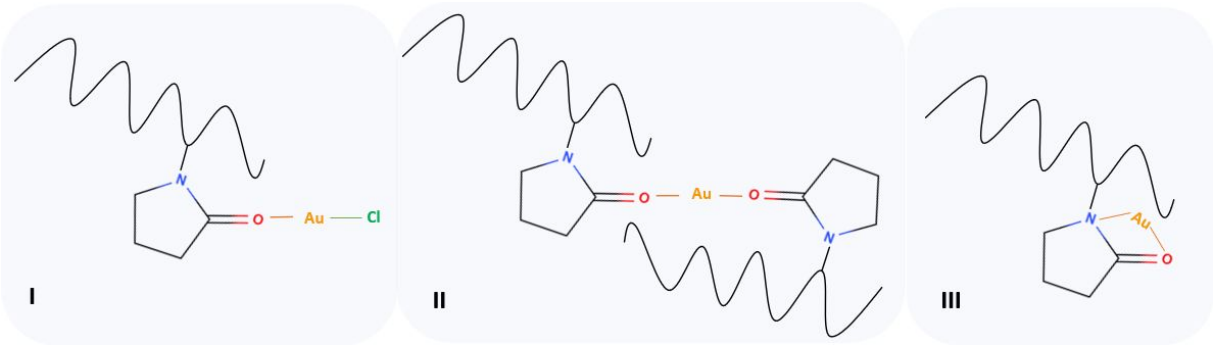


Figure S4: Scattering (A and D), absorption (B and E), and extinction (C and F) cross-section spectra simulated as a function of wavelength for the AuNPs targets (0S: Spherical, 1S: Spherical with one spike and 2S: Spherical with two spikes) considering the electric field polarization along TA and LA respectively considering the dimensions presented in the

Figure S3 and α = 5°. Note: The extinction spectra are the combination of the absorbance and scattering spectra for each target.



Scheme S2: Possible coordination for PVP and Au^{I} species.

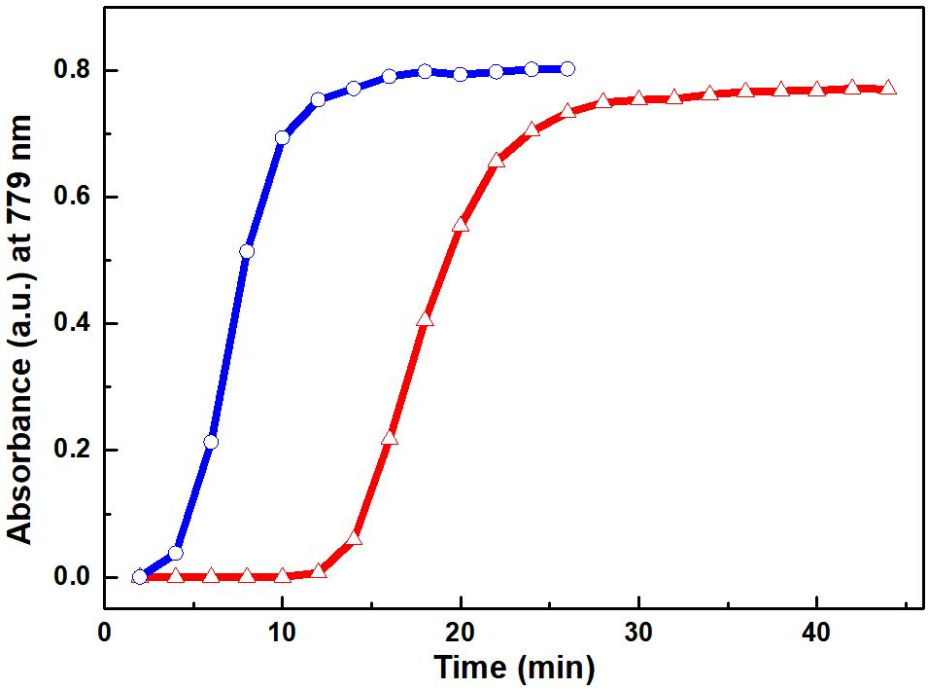


Figure S5: Absorbance variation at 779 nm versus the reaction time for the NMP solutions containing 7 wt.% of PVP and 1.25×10^{-4} M of $HAuCl_4$ without any seeds: red line with triangle symbols (—△—), the same solution in the presence of PVP-capped AuNPs as seeds: blue line with circles symbols (—○—).

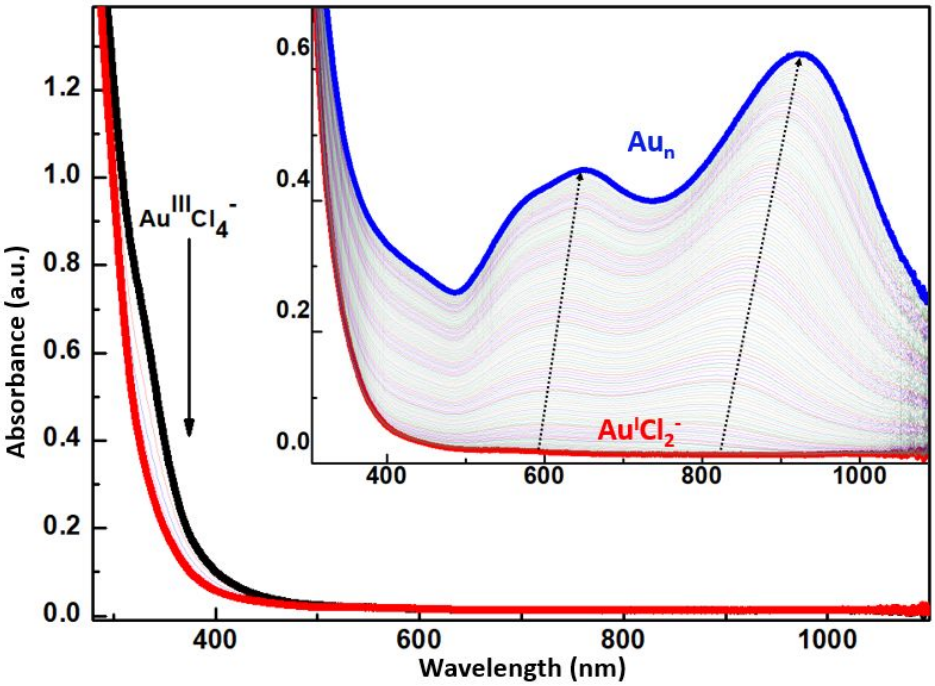


Figure S6: Evaluation of UV-Vis-NIR spectroscopy for studying NMP solution containing 1.8 wt.% of PVP and seeds during 14 min after adding 1.25×10^{-4} M of $HAuCl_4$. Inset: Spectral evaluation of the same solution after 14 min until 270 min. (optical path: 1 cm, reference: NMP, time interval: 2 min).

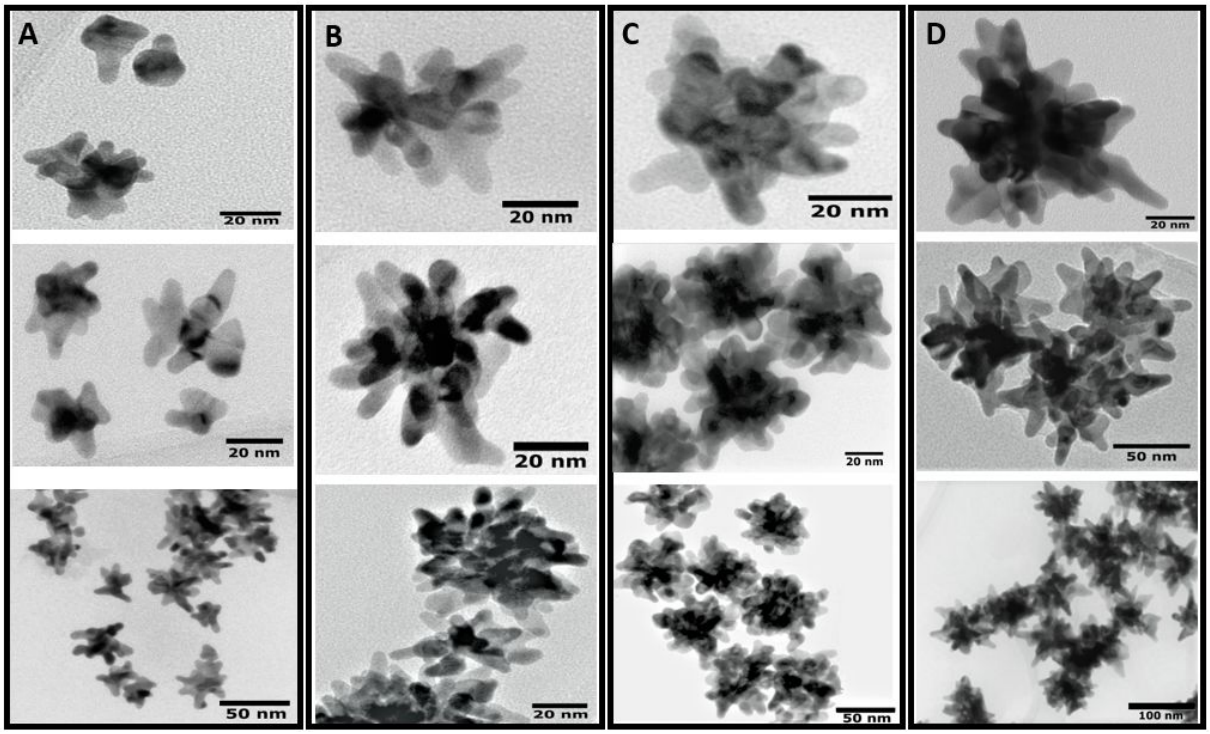


Figure S7: TEM images of AuNS synthesized with different magnification in NMP solutions containing 1.25 × 10-4 M of HAuCl4 and 13 wt.% (A) and 7 wt.% (B) of PVP. The images (C) and (D) related to AuNS synthesized in the solutions containing 7% wt. and 1.8 wt.% of PVP respectively in the presence of 10 µl of seed solution.

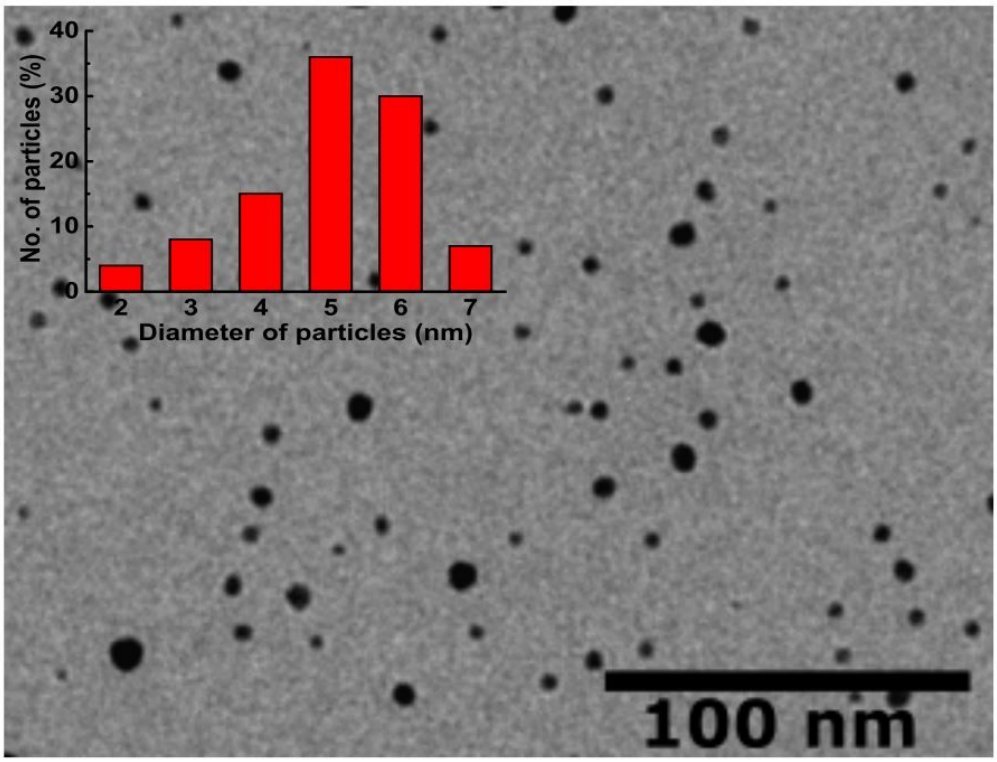


Figure S8: TEM image of PVP-capped AuNPs used as seeds, Inset: Histogram of particle size