

MAGNETO-PLASMONIC AU-Fe (OXIDE) HYBRID NANOPARTICLES: FROM SYNTHESIS TO SERS APPLICATIONS

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INTRODUCTION

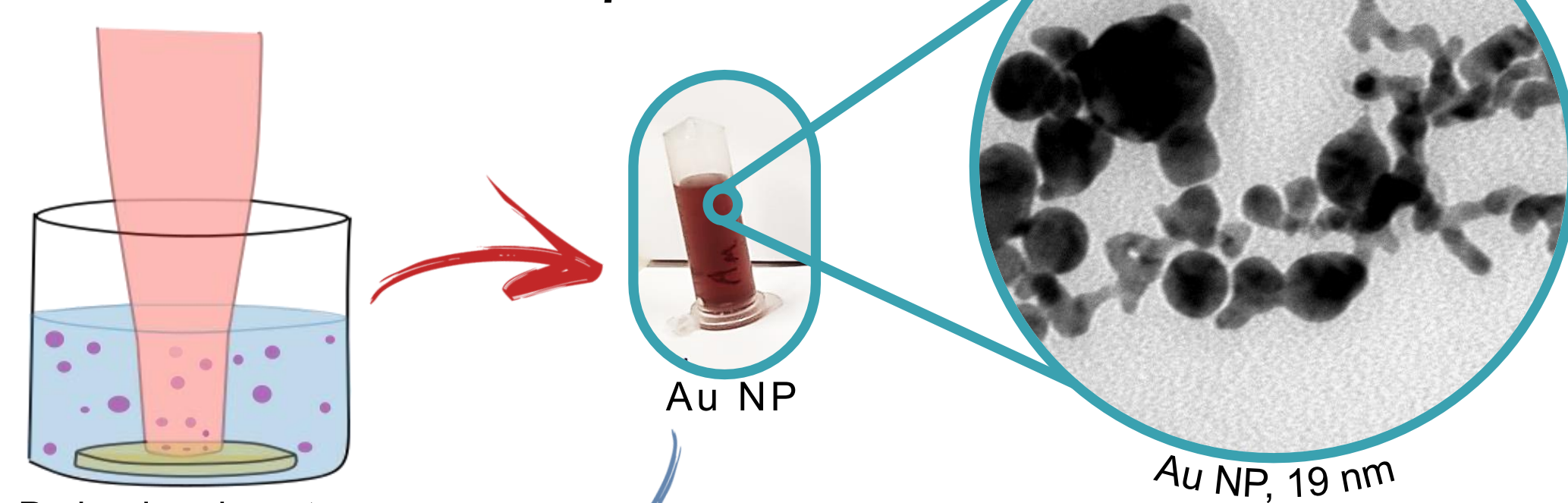
- Magneto-plasmonics (MP) are **multifunctional nanomaterials** combining plasmonic and magnetic properties.
- Achieved by integrating **plasmonic metals** (Au, Ag) with **magnetic 3d metals** and oxides.
- In this study: synthesis of **Au-Fe (oxide) core-shell nanoparticles (NPs)** by Laser Ablation in Solution (LASiS).
- Targeted for **biophotonic applications** such as bioseparation, in vivo imaging, and sensing.

METHODOLOGY

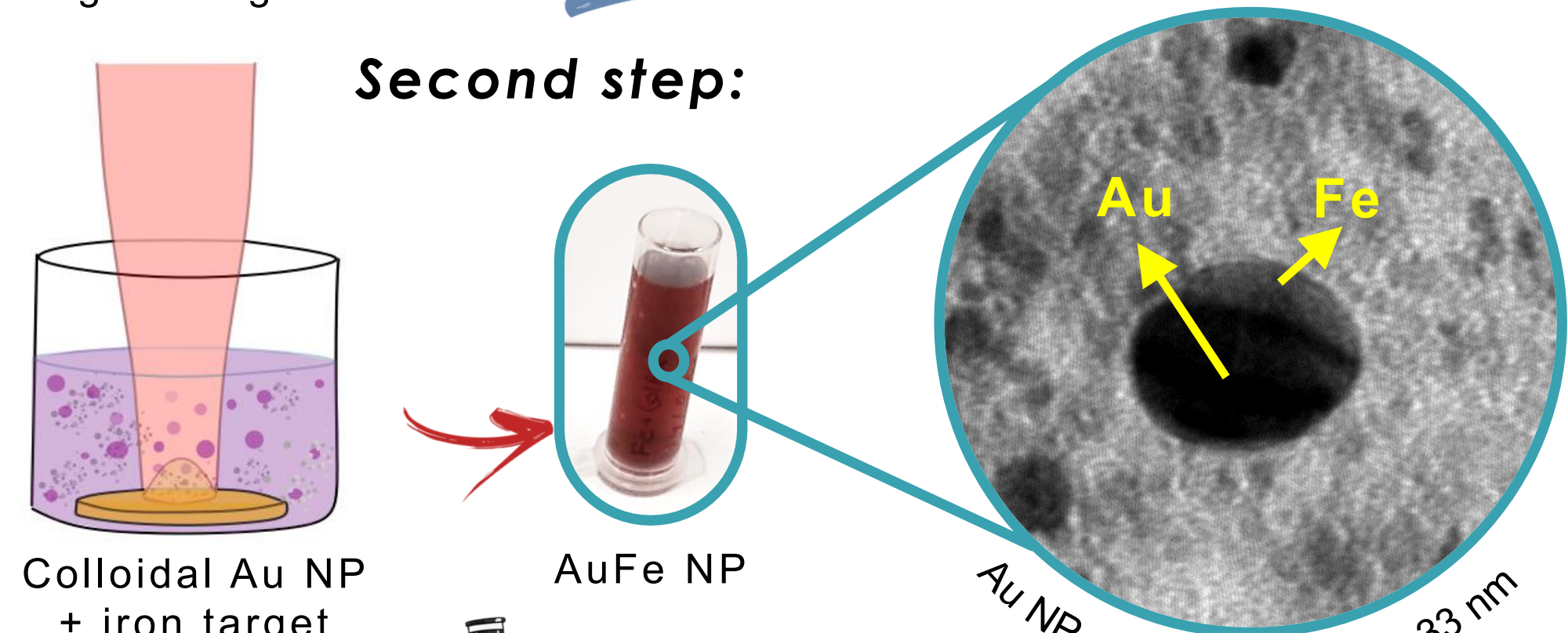
Laser Ablation Synthesis in Solution (LASiS) in pure water.

- Fiber Laser @ 1064 nm
- 50 kHz, 0.5mJ, 400ns

First step:



Second step:



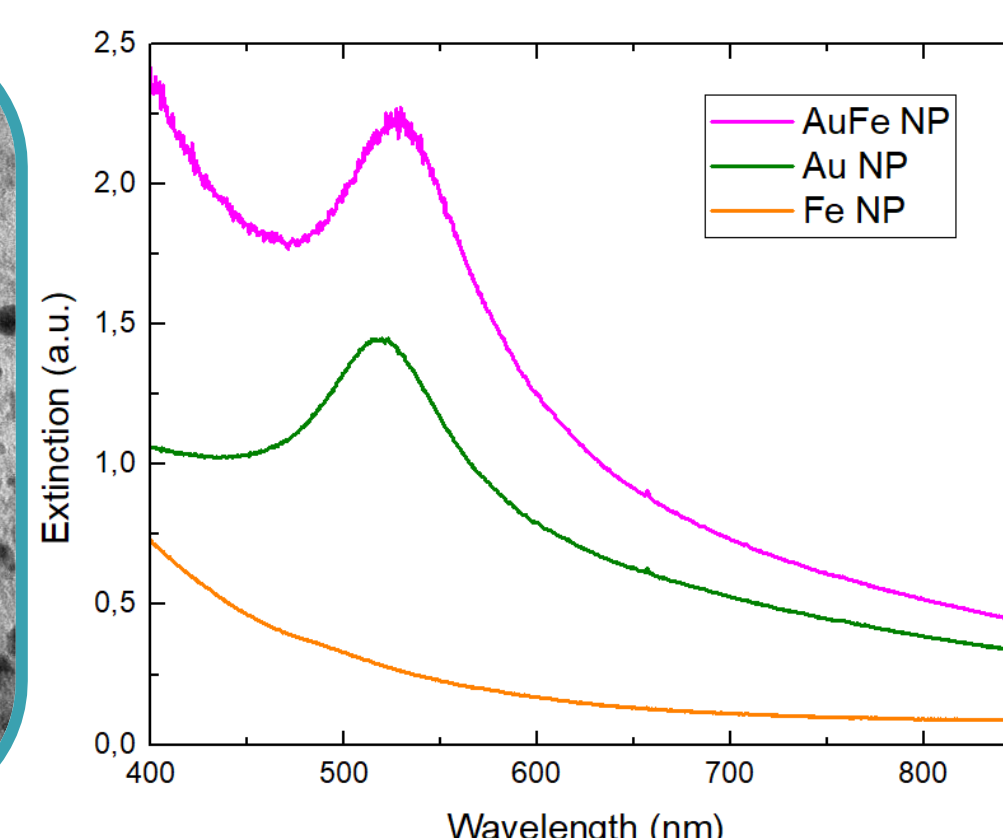
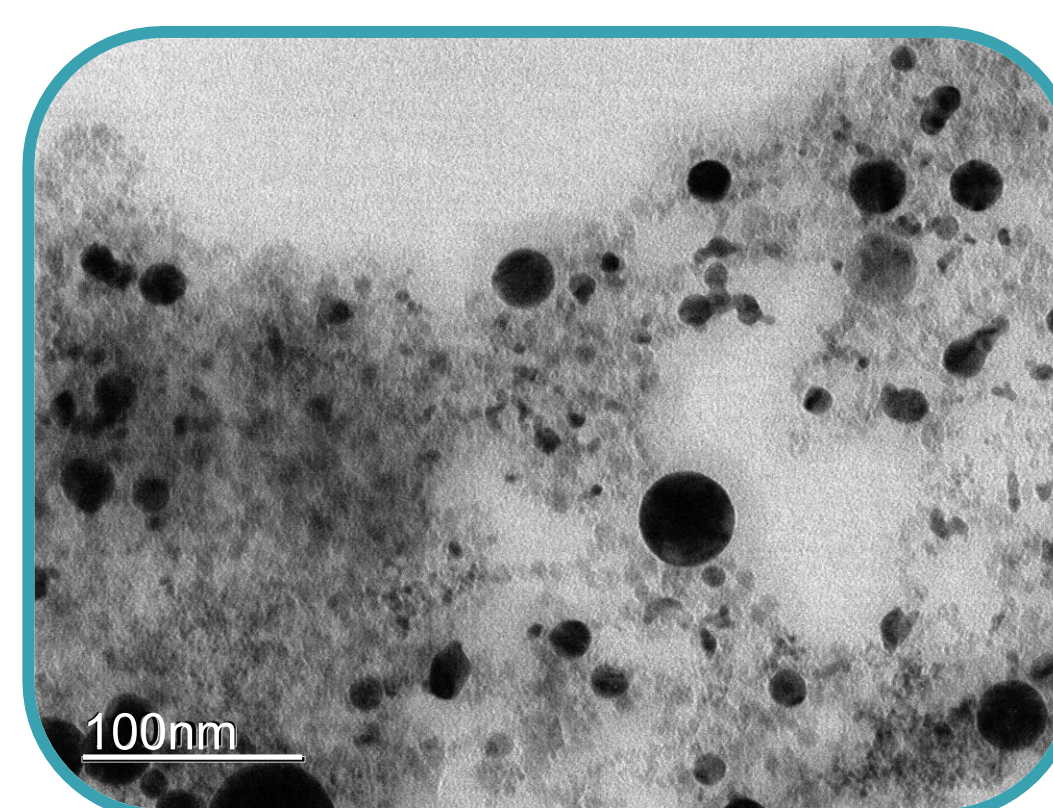
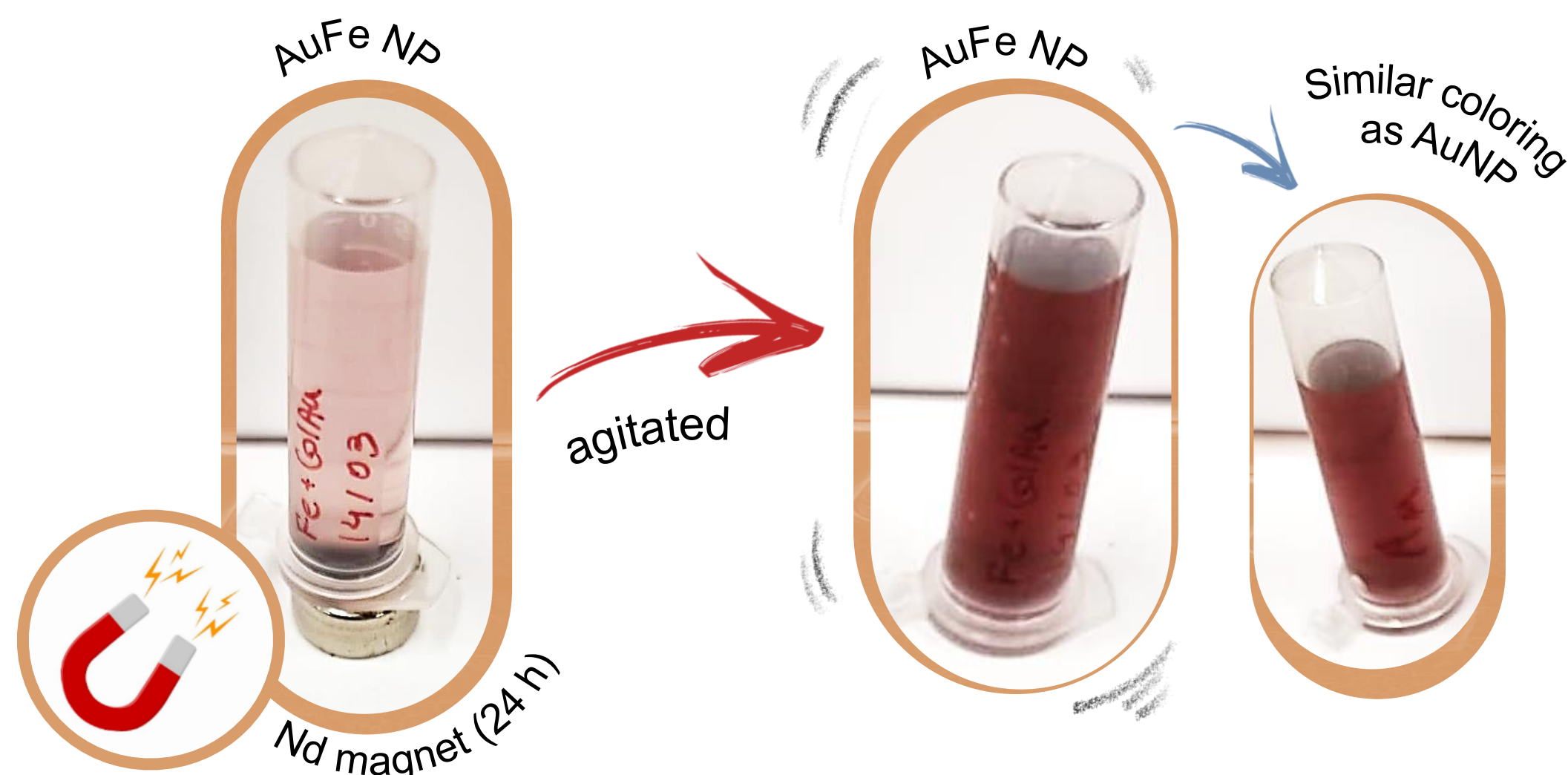
Confocal Raman microscope

WiTec Alpha300R @ 532nm / 10mW.

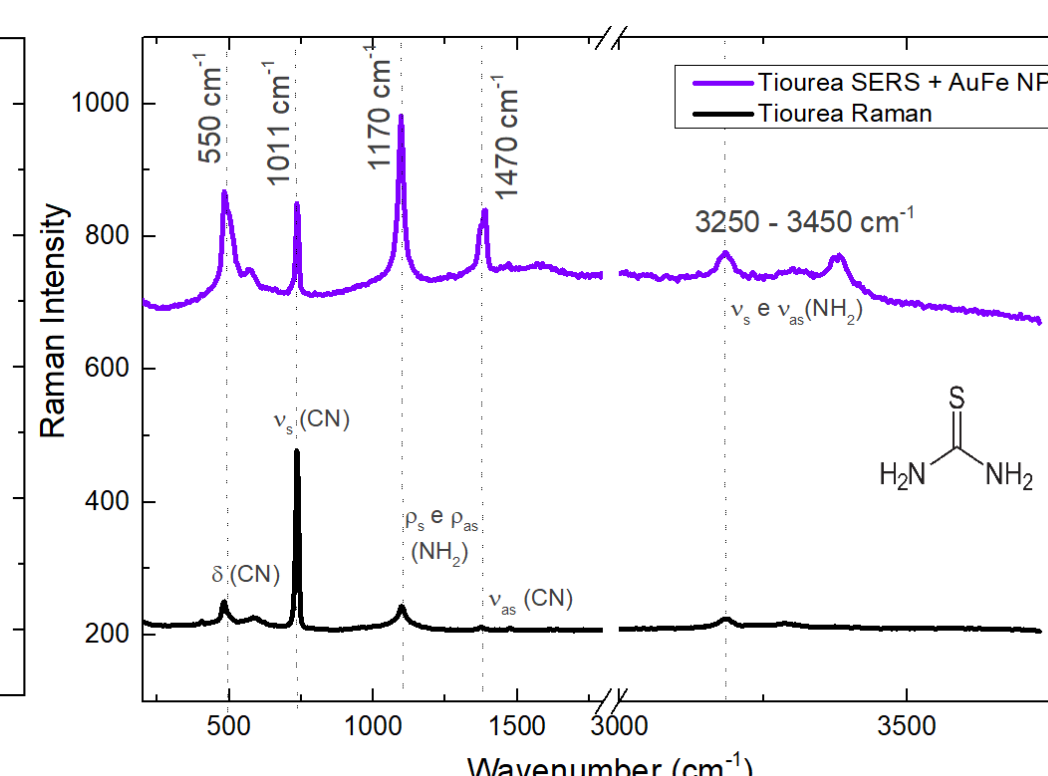
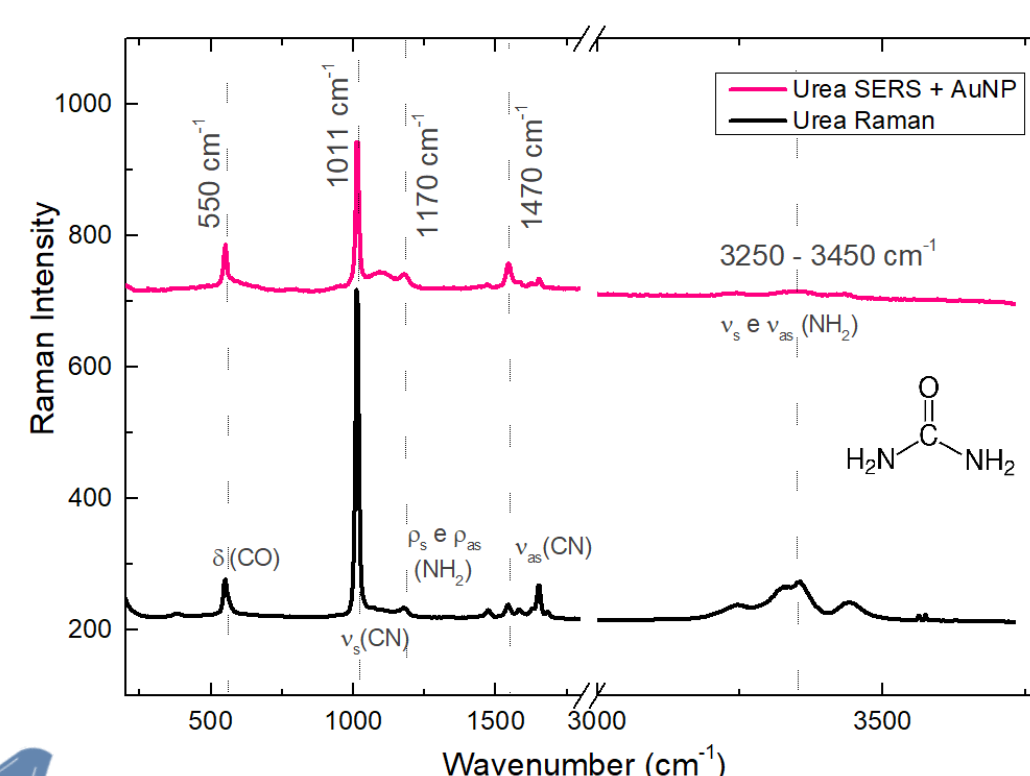
On glass: 1 μ L analyte + 1 μ L NPs

Urea and Thiourea

RESULTS AND DISCUSSION



Left: TEM image corresponding to AuFe NP at 50,000x magnification. **Right:** UV-Vis measurements indicating the colloidal extinction spectra. Inset: DLS for colloidal AuFe NP.



Left: Raman and SERS spectra of the organic compound Urea taken with AuFe NP. **Right:** Raman and SERS spectra of the organosulfur compound Thiourea taken with AuFe NP.

CONCLUSION

- Stable **Au-Fe (oxide) core-shell NPs** synthesized with dual properties confirmed: **plasmonic + magnetic**.
- Demonstrated **applicability as SERS substrates** for detecting trace biomolecules (amino acids, urea).
- Represent a **promising platform** for future biophotonic applications.
- **Next steps:** optimize synthesis parameters and explore surface functionalization for specific biosensing.

REFERENCES:

[1] New Trends in Nanoparticle Magnetism. Springer International Publishing, 2021.

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