C2-07: INCORPORATED SURFACE PLASMONS INTO CORE-SHELL FLUORESCENT NANOPARTICLES USING MICROEMULSION ASSISTED PHOTOREDUCTION TECHNIQUE

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MAIN OBJECTIVE

Development of **incorporated surface plasmons into core-shell fluorescent nanoparticles (NPs) using microemulsion assisted photoreduction technique**, approaching two routes:

- hollow NPs encapsulating chromophores;
- NPs coated with a silica layer to which chromophores are covalently bonded.

TEAM OBJECTIVE

RO team:

- synthesis of AuNPs in aqueous microemulsions;
- synthesis of AuNPs in non-aqueous microemulsions;
- study of factors controlling the size, structure and stability of NPs;
- structural and morphological characterisation of NPs.

CEA team:

- spectroscopic study of AuNPs combined with chromophores.

RESULTS – RO TEAM

Synthesis of simple AuNPs in W/O and O/W microemulsion

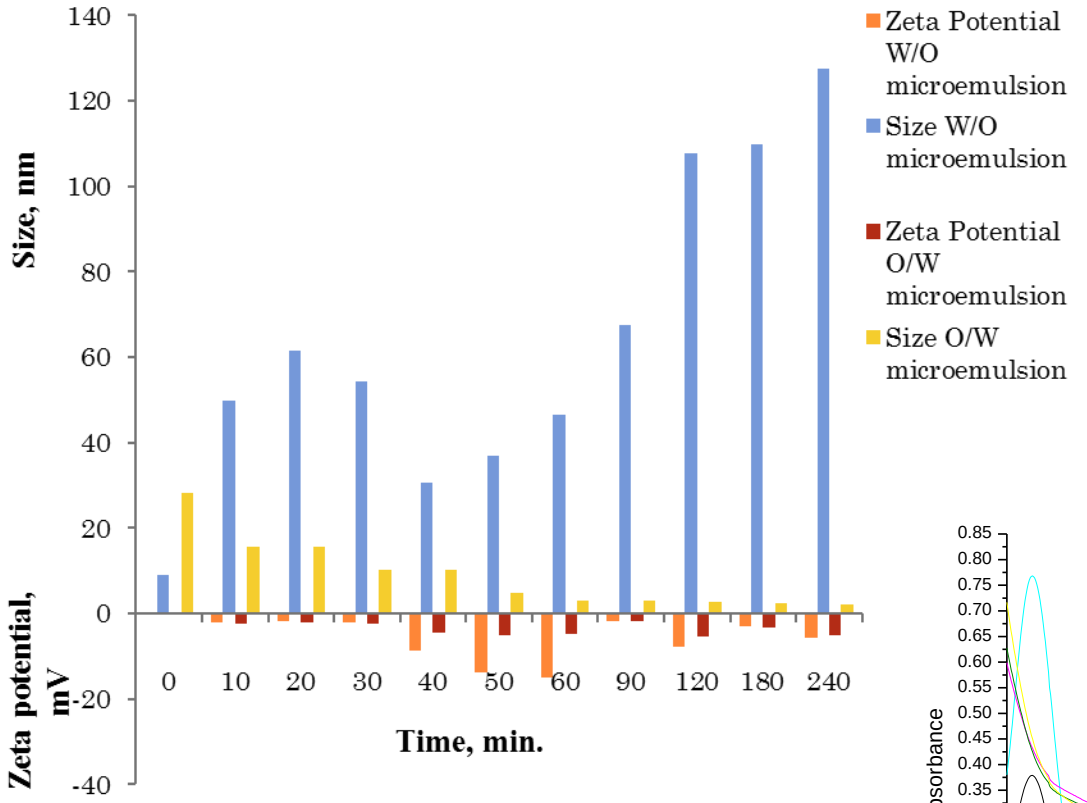


Fig. 1. Size and Zeta Potential of AuNPs obtained in W/O microemulsion (heptane – Brij30 - $HAuCl_4$) and O/W microemulsion (heptane – Triton X-114 - $HAuCl_4$ - butanol)

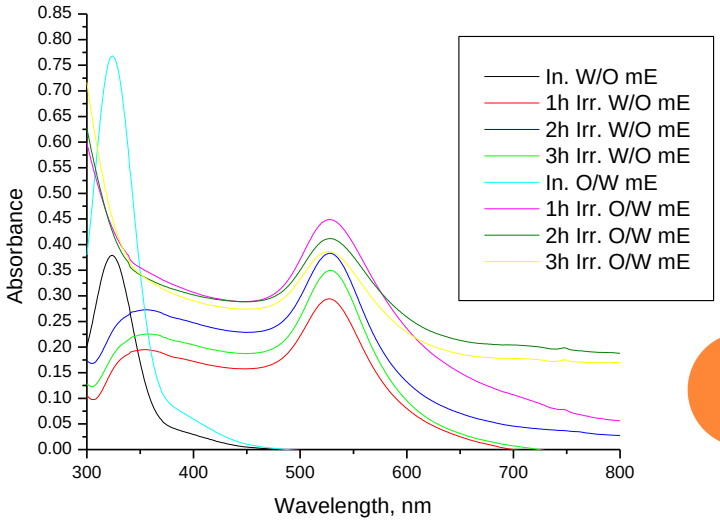


Fig. 2. UV-Vis Spectroscopy of AuNPs obtained in W/O microemulsion (mE) and O/W microemulsion (mE)

RESULTS – RO TEAM

Synthesis of simple AuNPs in W/O microemulsion stabilized with 3-MS thiol

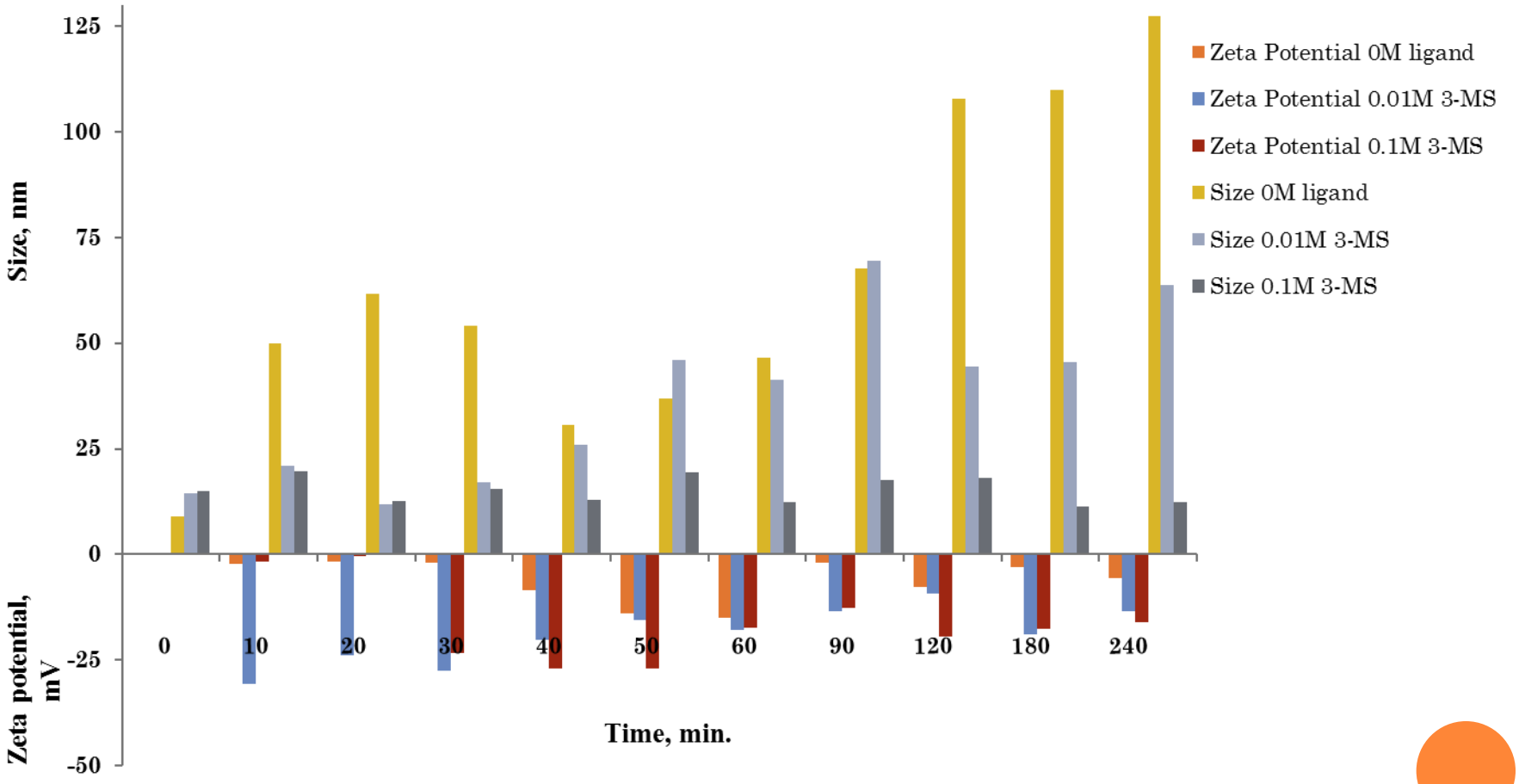


Fig. 3. Size and zeta potential for AuNPs stabilized with 0.1M sodium 3-sulphonate mercaptopropane (3-MS)

RESULTS – RO TEAM

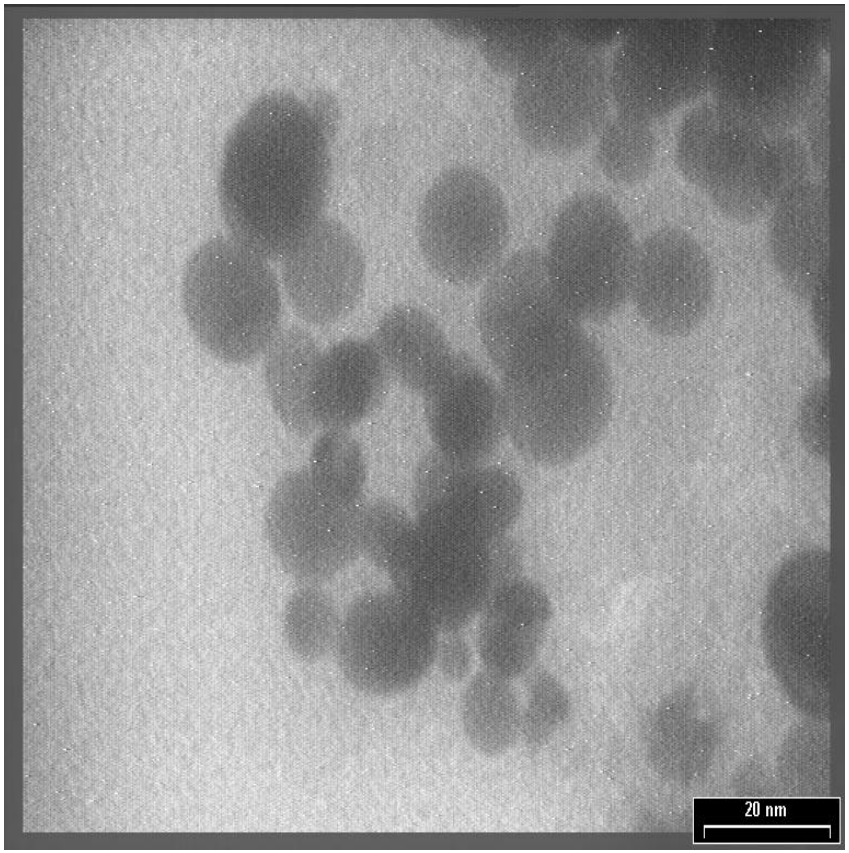


Fig. 4. TEM analysis of Au NPs stabilized with 0.1M 3-MS

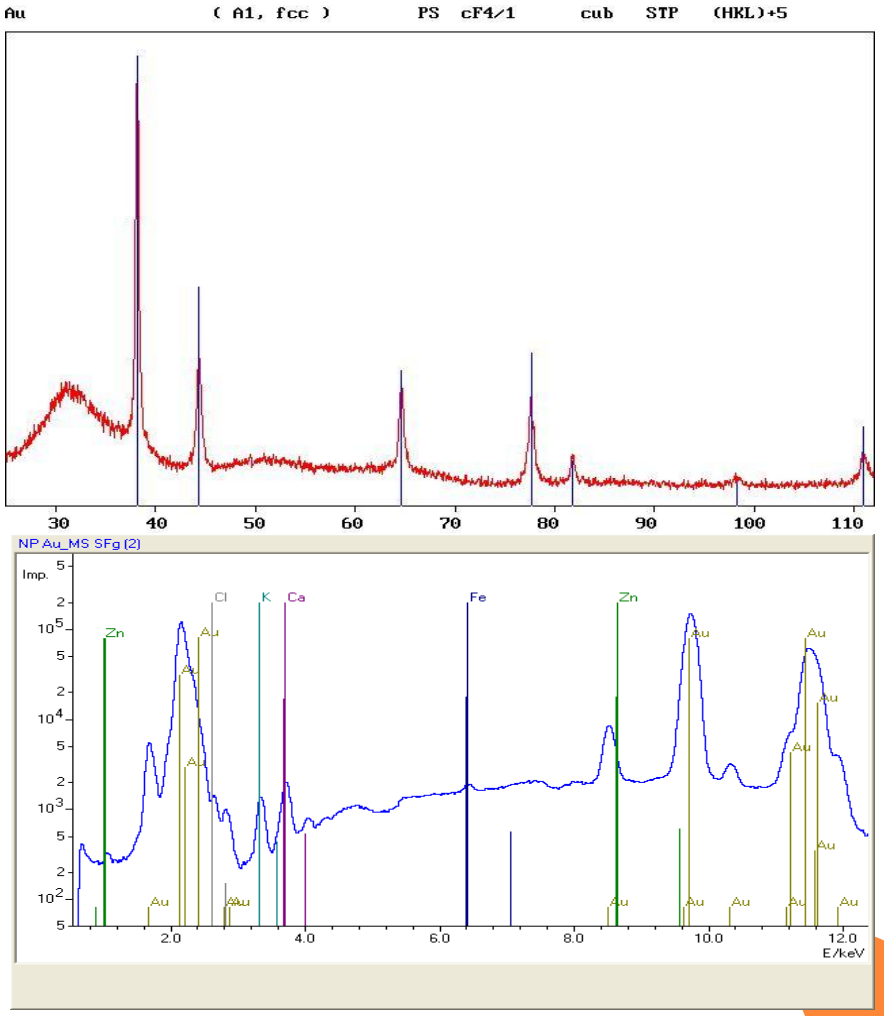


Fig. 5. XRD and EDAX analyses of AuNPs stabilized with 0.1M 3-MS

RESULTS – CEA TEAM

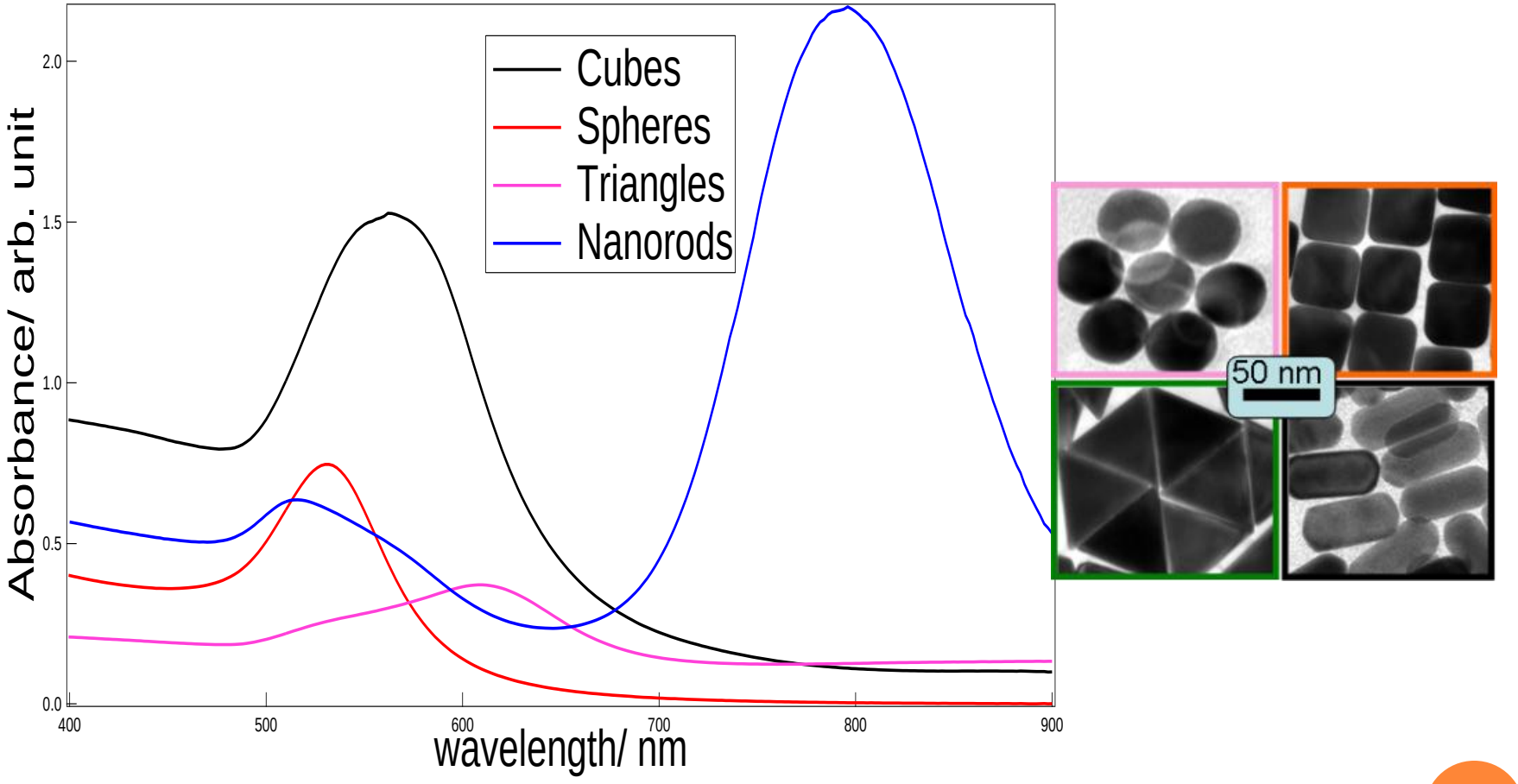
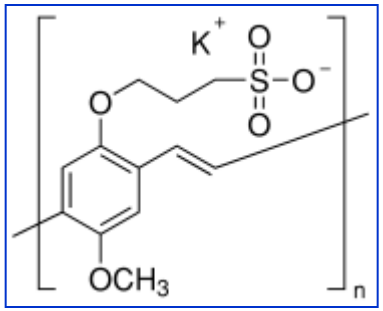
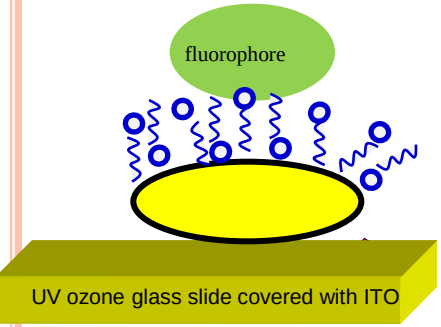


Fig. 6. UV-vis extinction spectra of water solutions of AuNPs with different shapes but similar sizes

Results – CEA Team

PPV





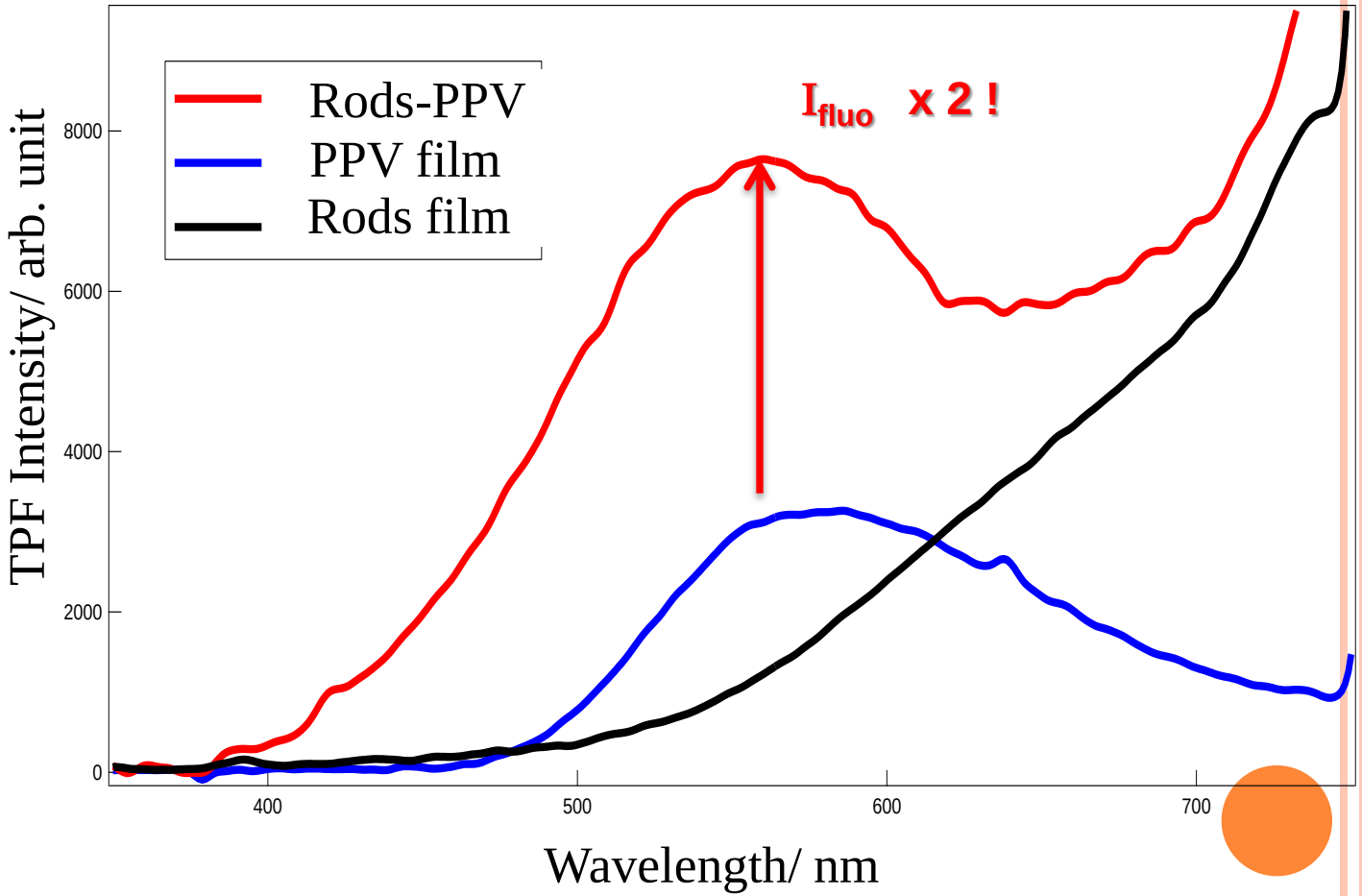


Fig. 7. TFP (two photon fluorescence) for coupled system

COOPERATION BENEFITS

- microemulsion assisted photoreduction technique – interesting perspectives in the whole domain of nanoscience and nanotechnology;
- preparation and characterization of AuNPs with some chromophores (RO team);
- imaging with AFM–STM, RAMAN microscopy and Time resolved two-photon excited fluorescence measurements (at CEA);
- three PhD stage.

PERSPECTIVES

- optimization of synthesis of ‘bulk’ and hollow AuNPs coupled with chromophores;
- optimization of thickness of silica linked chromophores layer for fluorescence signal enhancement;
- moderate fluorescence enhancement: new experiments to be performed on « diluted PPV layers »;
- in-situ AFM topographic characterisation.

THANK YOU FOR YOUR ATTENTION!