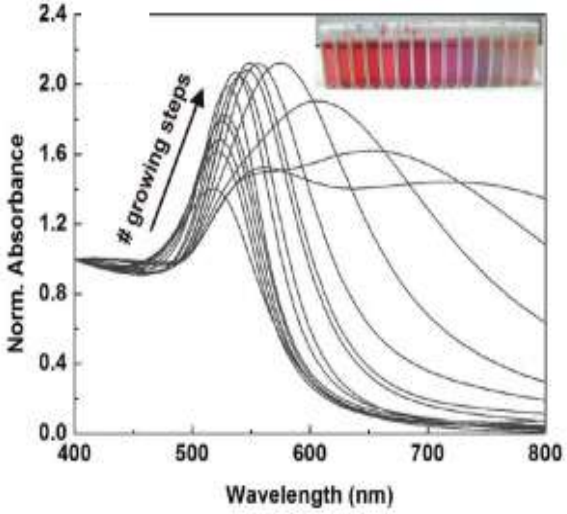
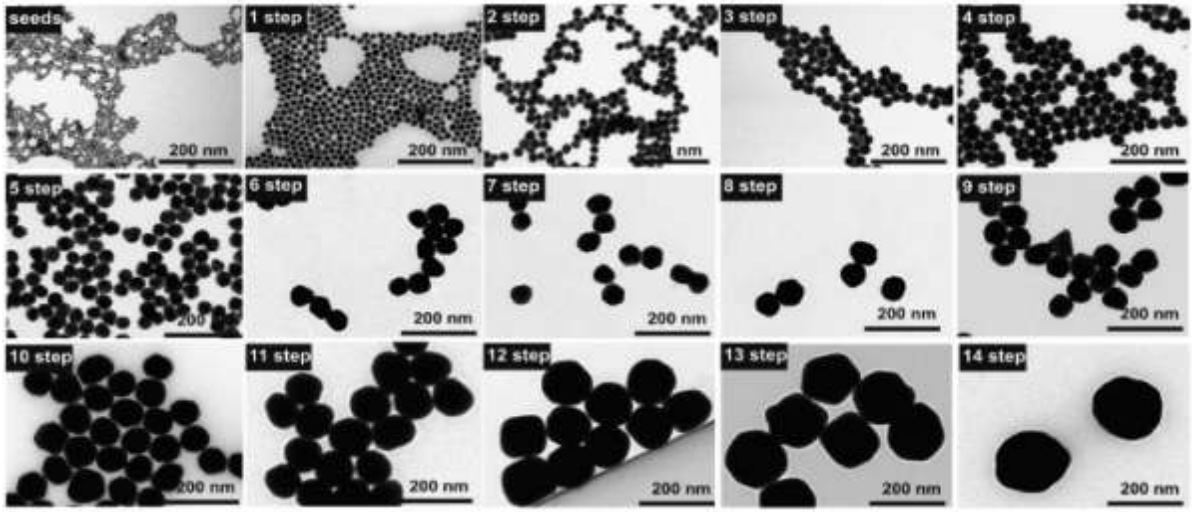
APPLIED NANOPARTICLES

A Nanotech Engineering Company

Main outcomes of being part of NanoFASE

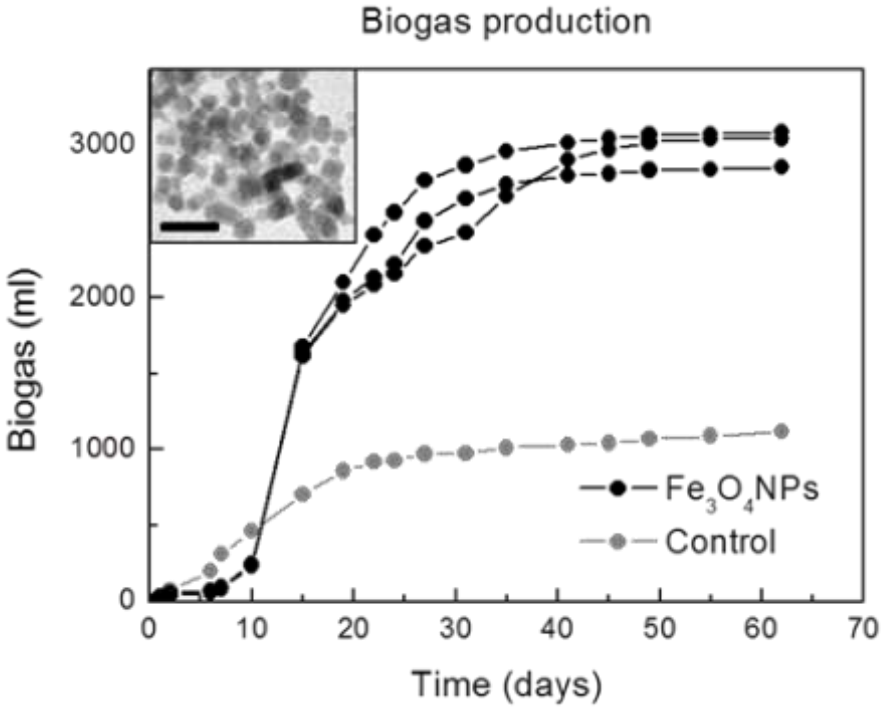




NanoFASE Closing Meeting
5-6th September 2019
Wien

- **APPLIED NANOPARTICLES S.L. (AppNPs) is a nanotechnology-based spin-off** of three Catalan Research Institutions (**ICN**, UAB and ICREA) founded in **October 2013**.
- AppNPs has its offices in Barcelona 22@ District and the **laboratory premises** in **the Vall d'Hebron Institut de Recerca (VHIR)**, within a Hospital Campus.
- We want to **empower researchers** by designing and supplying high quality Nanoparticles Colloids, while providing expert advice on their use

BioGAS+ is an additive based in the Fe_3O_4 NPs (Magnetite) which BOOSTS (up to 185%) the production of biogas → <u>Dosing at the Nanoscale</u>



<u>Small</u> 2014 Jul 23;10(14):2801-8, 2741. doi: 10.1002/smll.201303703.

APPLIED NANOPARTICLES

A Nanotech Engineering Company

NanoFASE

Our Services: 1. Consulting and Engineering 2. NPs Providers 3. Education and Training on RRI

In House

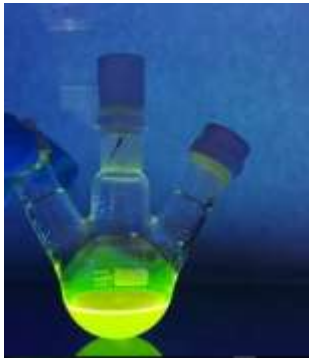
1. NPs design and defining a recipe

Understanding the problematic

Proposing a model NP

Proof of principle

From few ml to 150ml



2. Scale up studies

Modifications to allow scale up to 10L

Externalised

3. Industrialisation feasibility studies

Reactors from 100L to 500L

So far, only in aqueous media

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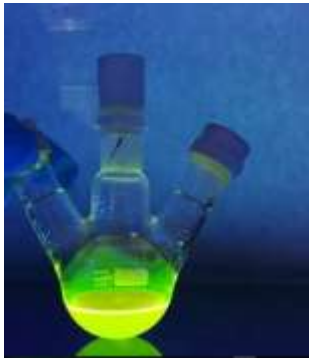

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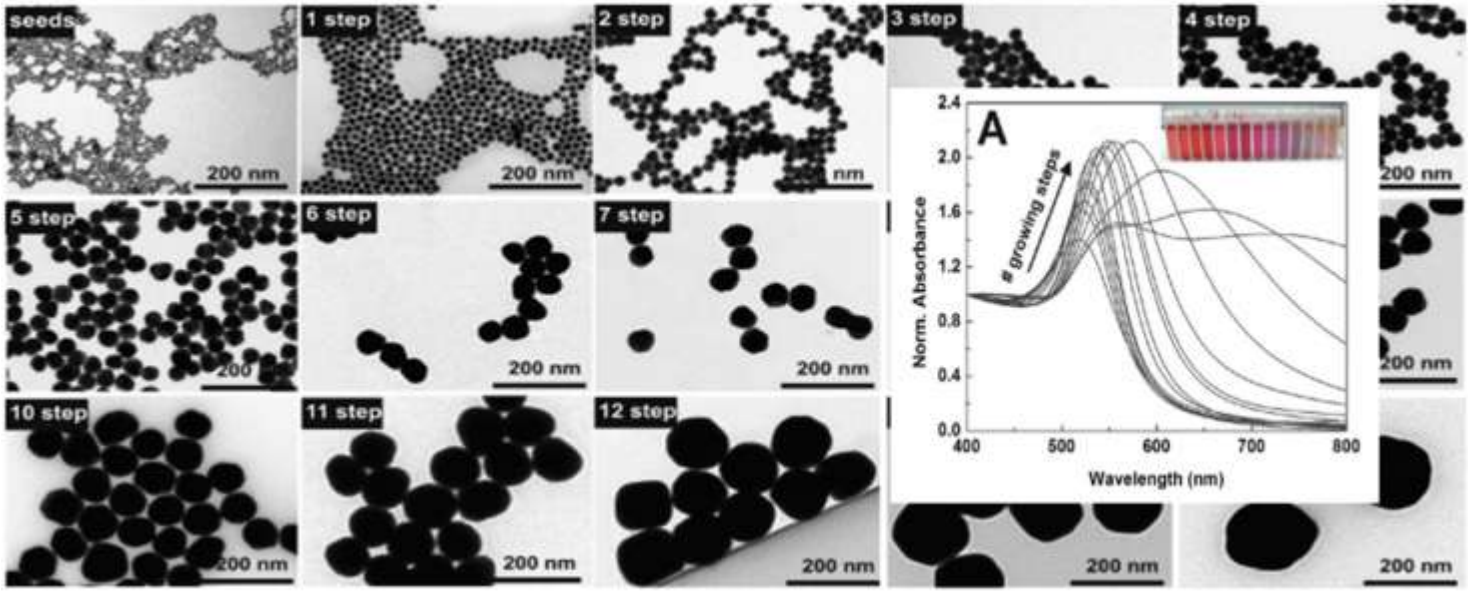
15-30kg of Fe_3O_4NPs Batches

Taking advantage of the **expertise acquired within ICN's Inorganic Nanoparticles Group (Prof. Víctor Puntes** and Martí Busquets**)** , AppNps also offers:

Model NPs Services: Production, characterization and commercialization of model inorganic NP with high **morphology and monodispersity control** : **AuNPs, AgNPs, CeO_2NPs, TiO_2 NPs, Fe_3O_4NPs, Fe_2O_3NPs.. → GRAMS RANGE**

NPs Atelier Service: Design, production and functionalization of complex or non-standard nanoparticles on demand (such as multicomponent NPs or functionalization with specific peptides). → **100's MG RANGE**



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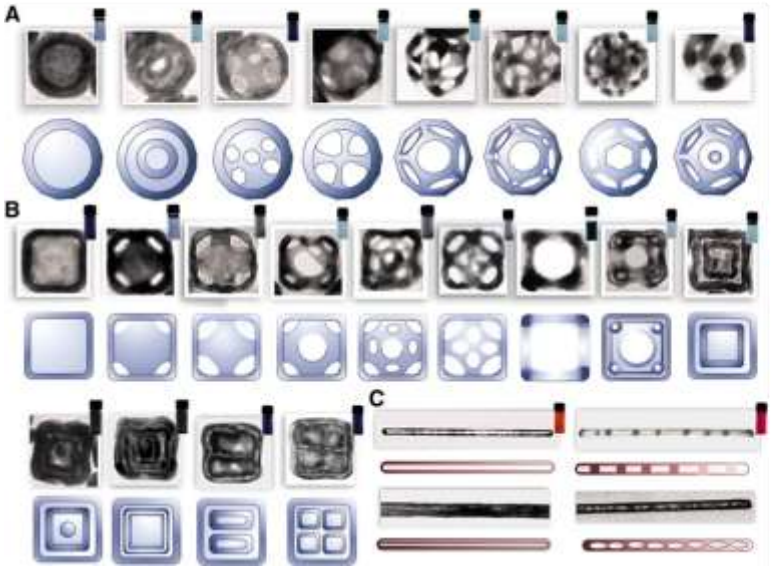

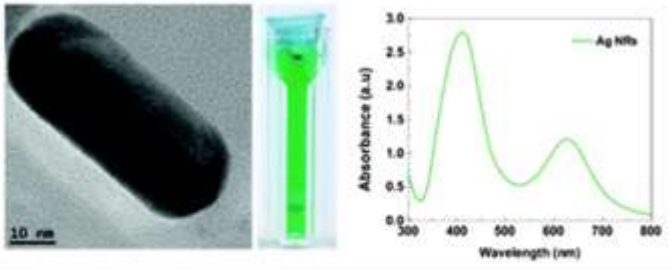

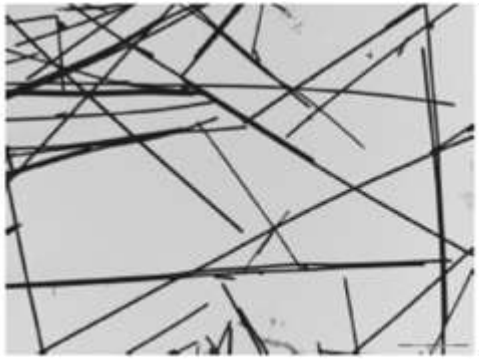

MAIN OUTCOMES:

1) NEW PRODUCT : Ag_2S NPs

- as a model of sulphidized Ag NPs in soils
- developed *ad hoc* for NanoFASE project

2) IMPROVED SYNTHETIC PROCESSES:

- to meet partners' quantities and concentration requirements
- Larger scales
- Higher concentrations: Improved post-synthesis processing
- One pot seeded-growth strategy

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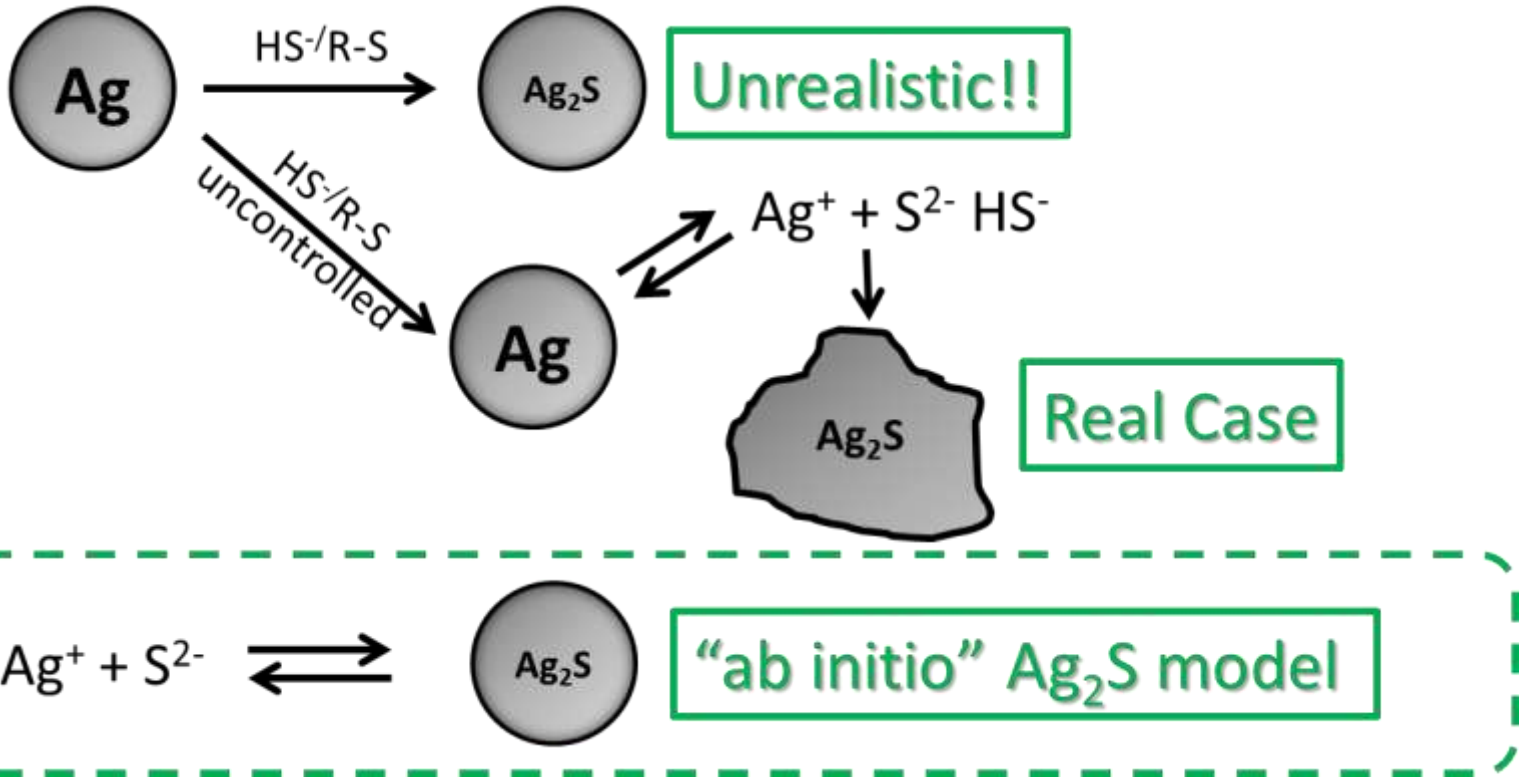


The Pandora Nanoparticles Menu *by Applied Nanoparticles*


15nm AgNPs


50nm AgNPs


5-10μm AgNWs


20nm Ag_2S NPs

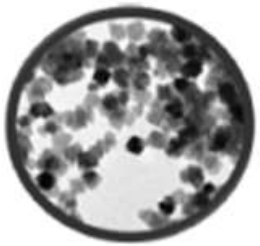

5nm AuNPs


20nm AuNPs


50nm AuNPs


8nm Fe_3O_4NPs
(superparamagnetic)


5nm CeO_2NPs


10x10nm CeO_2 Stamps


7x15nm TiO_2NRs


40nm CuONPs

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Allowed us to provide Master Batches for the whole Consortium

Metals NPs

Low concentration synthesis

(in aqueous media)

AuNPs max 50 mg/L

AgNPs max 100mg/L

Higher morphology control (seeded growth multi step strategy → Monodispersity)

Can be discretely dispersed

Slower settling times

(Some) Prone to corrosion/oxidation

Metal Oxide NPs

High concentration synthesis

(in aqueous media)

From 1g/L up to 30-60g/L

Lower morphology control

Very Difficult to "grow"

Tend to agglomerate → aggregate

Faster settling times

Less prone to corrosion

Already partially or totally oxidized

Working together after NanoFASE

Think about us if you need:

- **High Quality NPs colloids** (high monodispersity, high concentration, high colloidal stability...) at **very affordable prices.**
  (compare Sigma Aldrich: 180.000€/g of AgNPS!!! And very diluted : 0.02mg/ml)

- **Explore the synthesis of new model NPs** ,
  "The Nanoparticles of your dreams"

- **Master Batches** for the entire length of a Project

- **Micro/nano Plastics!!!**

Working together after NanoFASE

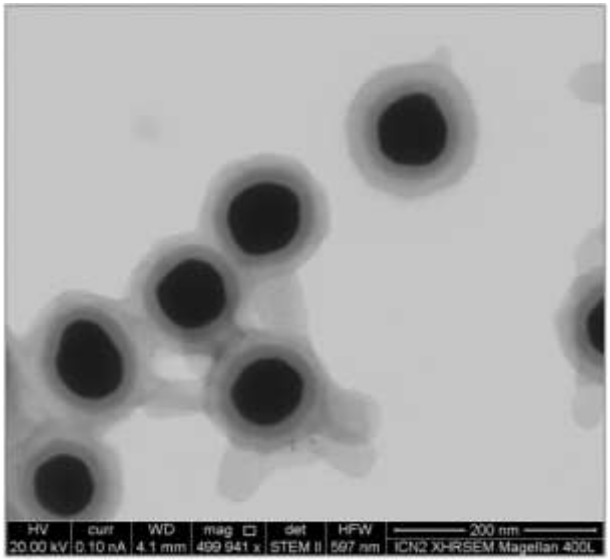
Micro/nano Plastics – Polystyrene nanoparticles up to 500nm

- **Chemically labelled (with AuNPs core)**
- Fluorescently labelled (with FITC)

Au@SiO2@PS

From 80 to 500nm

Exploring Still in the mg/L range



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