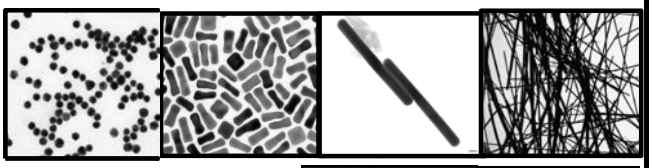
Research Infrastructure QualityNano

Wet synthesis of Inorganic Nanoparticles	**Category:** A. Particle Synthesis **Institute:** Institut Català de Nanotecnologia (ICN) **Location:** Campus UAB Contact Details of Technology Expert: Jordi Piella Tel. +34-93 737 46 24 Email: jordi.piella@icn.cat

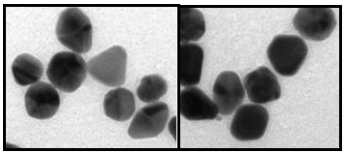
Short technology description/Overview:

We have extended the group expertise from typical Co and Au to other NPs, mainly: Ni, Fe_3O_4, Fe_2O_3, Ag, AgO, CuO, Pt, TiO_2, CeO_2, ZnO, CdSe. These are relevant from both the research and the industrial point of view. Our group has at this point a highly skilled expertise on NP synthesis.

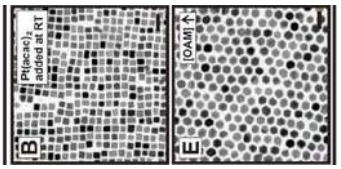
Au: We have extended the citrate-reduction method developed by Turkevich to the synthesis of spherical Au NPs of narrow size distribution from 6 up to 200 nm. Smaller NPs are also obtained using stronger reducing agents or carrying the synthesis out in organic solvents.



Ag: Preparation of Ag NPs in aqueous phase (citrate-reduction or NaBH4), using $AgNO_3$ in polar solvents. NPs from 10 nm to 80 nm are obtained. In organic solvents starting from $AgNO_3$ can narrow the size distribution and Ag NPs can later be transferred to water. Control of size and shape – nanospheres, nanocubes, nanorods and nanowires – is achieved using polyols and in the presence of polymeric stabilizers (PVP).

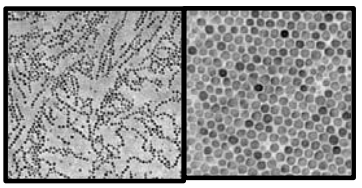


Pt: Pt NPs of different shape morphologies (cubic, polypod, cuboctahedrons and raspberries). Synthesis in an organic solvent using Pt(acac)2, olyelamine and/or 1,2 hexadecanediol. In aqueous solution the reduction of platinum salts with sodium citrate or NaBH4 yields to Pt NPs of small size (2-3 nm).

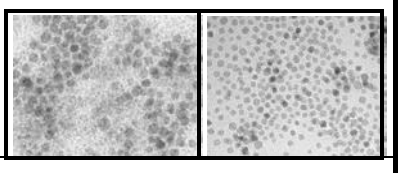


Pd: Nanospheres, nanocubes and nanocages of Pd NPs can be obtained either with the method that involves polyol or with water-based systems. In the latter, the synthesis NPs with narrow particle size distribution is based on the reduction of $PdCl_4^{2-}$ by hydrogen gas or chemical reagents as L-ascorbic acid, citric acid, and PVP.

Magnetic NPs of Co, Fe and Ni: Controlled synthesis (size, shape, composition) consists on the decomposition of organo-metallic precursors hosting the desired element, in the presence of surfactants (TOPO, oleic acid), in organic phase (toluene, dichlorobencene) and under inert atmosphere conditions. Water soluble NPs are obtained after metallic nanoparticles are synthesized in organic media through surfactant exchange.



Metal oxides (FeOx, CoO, CeO2, TiO2, CuO, ZnO): Several synthetic routes available: decomposition of organo-metallic precursors in organic solvents, sol-gel processes, hydrothermal decompostion of metal salts, oxidation of metal nanoparticles, precipitation of metal salts in basic conditions,and even with mechanical milling and/or grinding.



Main Features (Equipment Capabilities):

- **Shape control:** Nanospheres, Nanorods, Nanoboxes, Hollow nancages, Hollow nanocubes, Hollow nanotubes
- **Size control:** Monodisperse and highly concentrated—up to 10^{16} NPs/ml—from 4 nm to 200 nm. Nanorods of high aspect ratio (up to 200)
- **Surface control:** Custom NP surface can be tailored going from bare surface (ions act as stabilizer) to the unespecific coating provided by serum and to desired number and orientation of antibodies.

Any further Information: