NANOBRAND

BIOCOMPATIBLE GOLD NANOPARTICLES FOR LIFE SCIENCE USING GREEN CHEMISTRY

NANOBRAND

PRODUCTS AND SERVICES OFFERED BY NANOBRAND

01

NANO RESEARCH SERVICES

We offer GOLD NANOPARTICLES of various sizes, shapes, and surface coatings according to our PRODUCTS LIST – synthesized using green chemistry – free of stabilizing agents - highly monodisperse - customized configurations and volumes are available.

We offer NANO RESEARCH SERVICES for the companies wishing to integrate our nanoparticles into their products or to develop new products based on the use of our nanoparticles. We offer our COLLABORATION in creation of new active nanoparticles with the programmed properties for a wide range of applications.

We work in close co-operation with your researchers. Our team of scientists will support you from the development to the manufacturing stage of your end product.

We can assist you in managing specialized testing programs, such as evaluation of antimicrobial properties, attachment of antibodies, various IN-VITRO and IN-VIVO tests, etc. Our team works in near collaboration with academic and clinical researchers to deliver you the best results.

We produce gold nanoparticles which can be used in:

- Drug delivery and therapy research, gene delivery and silencing, photothermal therapy, medical imaging and development of vaccines,

- As biosensors in lateral flow assays and quick tests for detection of various substances of interest, such as bacteria, viruses, antigens, drugs and others,

- As active ingredients alone or conjugated to other actives, such as plants extracts and others.

Please CONTACT US to start discussing the type of nanomaterial you need, its intended application and the terms of our co-operation.

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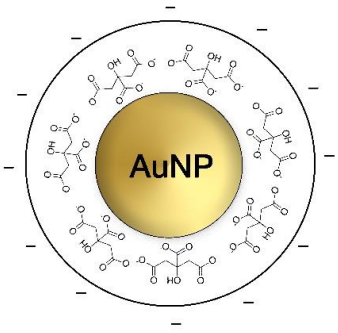
GOLD NANOPARTICLES PRODUCTS

02

GOLD NANO-SPHERES



Our spherical Gold Nanoparticles with standard monodispersity (coefficient of variation CV≤ 8% for 10nm size and larger) have citrate surface coating providing with the negative surface charge. Citrate is the most common surface coating permitting easy modification, as it can be easily displaced (e.g., by amines and thiols). Citrate-coated nanoparticles are suitable for the applications where minimal cytotoxicity is required.

The nanoparticles with the diameter of 5, 10, 15, 20, 30, 40, 50, 60, 70, 80, 90 and 100nm are available at three optical densities OD=1, 10 and 20, provided in Milli-Q water (18.1 MΩ-cm). Optical density is related to the concentration of gold in the nanoparticles products, slightly varying with the nanoparticles size. E.g., for gold nano-spheres with 15nm diameter, OD=1 corresponds to 50µg/ml, OD=10 to 500µg/ml and OD=20 to 1000µg/ml of gold concentration.

The nanoparticles parameters, which are measured and calculated specifically for each lot, are listed in Technical Data Specs accompanying each nanoparticles product; an example is shown in the Table below. The Technical Data also contain TEM-images, UV-vis spectra and the nanoparticles size distribution charts.

Diameter (TEM):	10.98 ± 0.28nm
Coefficient of polydispersity:	2.55 %
Mass of single particle:	1.338 E-14 mg
Surface of single particle:	378.75 nm^2
Volume of single particle:	693.12 nm^3
Particles concentration:	5.61 E+13 particles/ml
Molar particles concentration:	9.34 nM
Surface area (TEM):	28.31 m^2/g
Surface to volume ratio:	0.5464 nm^{-1}
Mass of gold:	50 µg/ml
Hydrodynamic diameter (DLS):	28.31 m^2/g
Zeta-potential:	-31.2mV
pH of the solution:	6 - 7
Particle surface:	Sodium Citrate
Solvent:	Milli-Q water (18.1 MΩ-cm)

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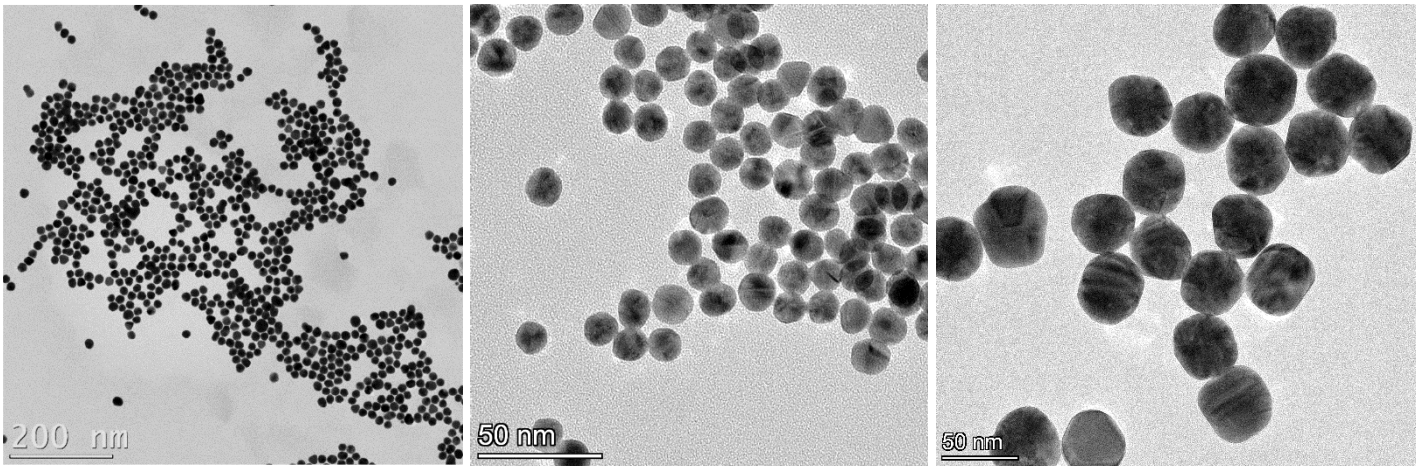
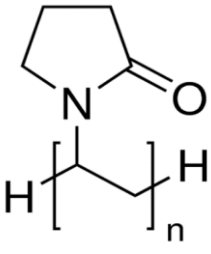


Citrate-coated Gold Nano-spheres of different sizes, CV < 8%

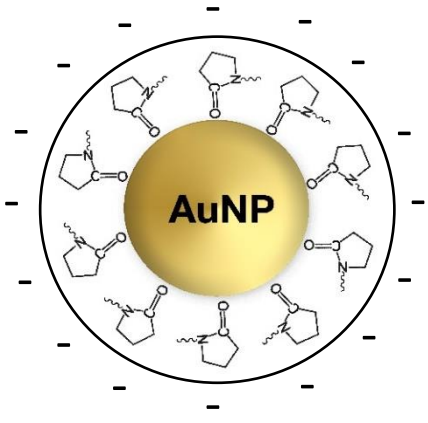
03

GOLD NANO-SPHERES WITH SURFACE COATINGS

These nanoparticles are also available with modified surface covered by the standard surface coating agents such as polyvinylpyrrolidone (PVP), polyvinyl alcohol (PVA), chitosan, branched polyethyleneimine (BPEI) and beta-cyclodextrin (beta-CD). We offer customized diameters/ concentrations/ surface coating agents /volumes, available on request.



Polyvinylpyrrolidone (PVP) is a common surface-coating agent, providing with negative surface charge and assuring high nanoparticles stability in different media. PVP-coated nanoparticles have been extensively studied for various biological applications.



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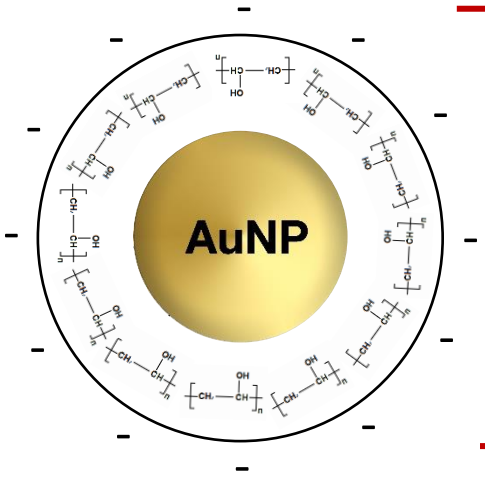
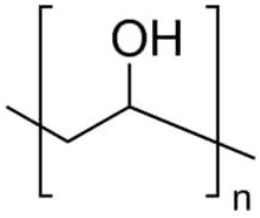
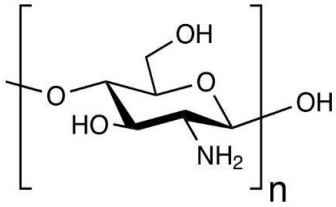
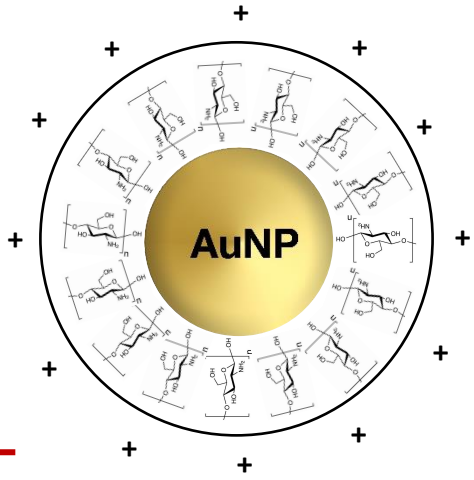


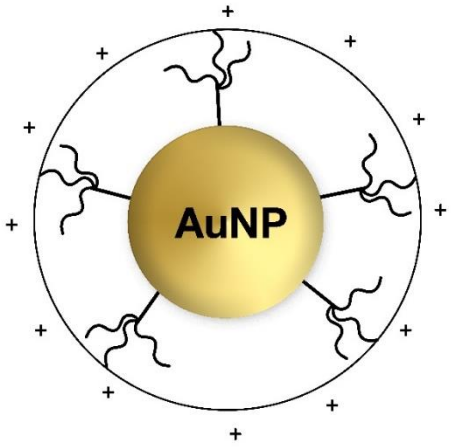
Polyvinyl alcohol (PVA) is a synthetic polymer which is used in a variety of applications because of its biocompatibility, low tendency for protein adhesion, low toxicity, and biodegradability. PVA-coated nanoparticles demonstrate great stability in various media. PVA is often used as a primary layer for consequent surface modifications.



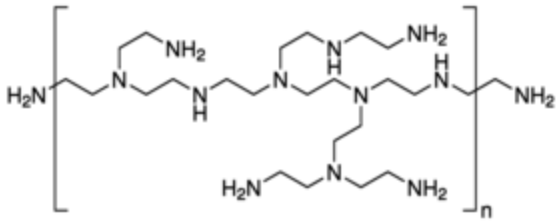


Chitosan-coated gold nanoparticles have been widely employed in biomedical research applications, as drug delivery systems and theragnostic agents. Chitosan is a natural non-toxic biodegradable macromolecule, demonstrating antimicrobial properties and enabling efficient interaction with cell membranes.





Branched polyethyleneimine (BPEI) is attributing positive surface charge to the coated nanoparticles, which promotes cellular uptake and gene transfection. Thus, BPEI-coated gold nanoparticles have been used as siRNA delivery vectors in numerous research studies. Binding of the coated nanoparticles to enzymes and bacteria was reported to enable their colorimetric determination.



All our nanoparticles are free from dispersing agents, and they do not contain any proprietary stabilizing agents

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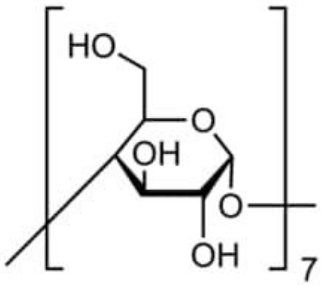
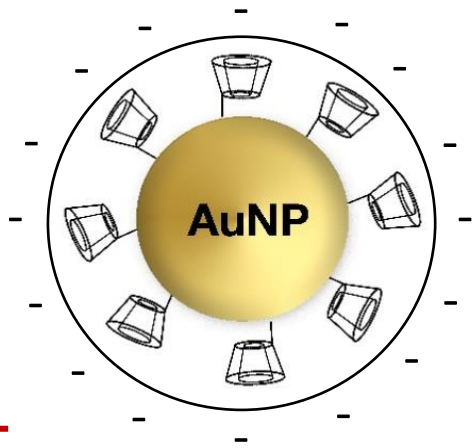
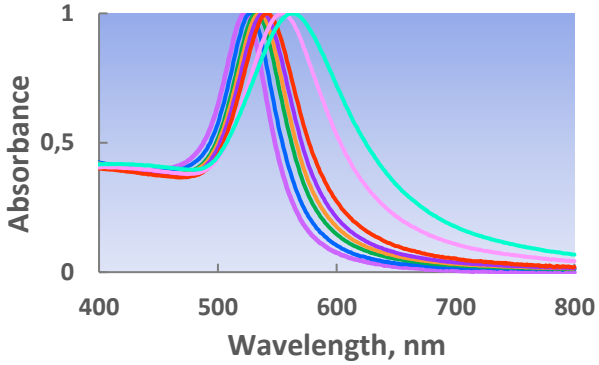


Beta-cyclodextrin (beta-CD) coated gold nanoparticles possess unique properties, provided by the structure of beta-CD molecules, which have hydrophilic surface and hydrophobic cavities with a diameter of the size of various biomolecules. Numerous applications of gold nanoparticles in biological and pharmaceutical fields can be developed based on the ability of beta-CD to act as a complexing agent.



04

ULTRA-MONODISPERSE GOLD NANO-SPHERES



We offer Gold Nano-spheres with nearly perfect spherical form and ultra-high monodispersity (standard variation CV ≤ 3% for sizes larger than 10nm). This represents the best monodispersity available on the market. Ultra-monodisperse nanoparticles are offered with two types of surface coatings: PEG5000-carboxylated and PEG5000-methoxylated, with 5kDa PEG spacer.

Polyethylene glycol (PEG) chains are attached to the nanoparticles surface via thiol groups leaving the carboxyl or methyl group available for further functionalization. This type of surface coating is very stable because of strong binding affinity of the thiols. PEGylation is required for a great variety of applications, providing the nanoparticles with excellent stability in different

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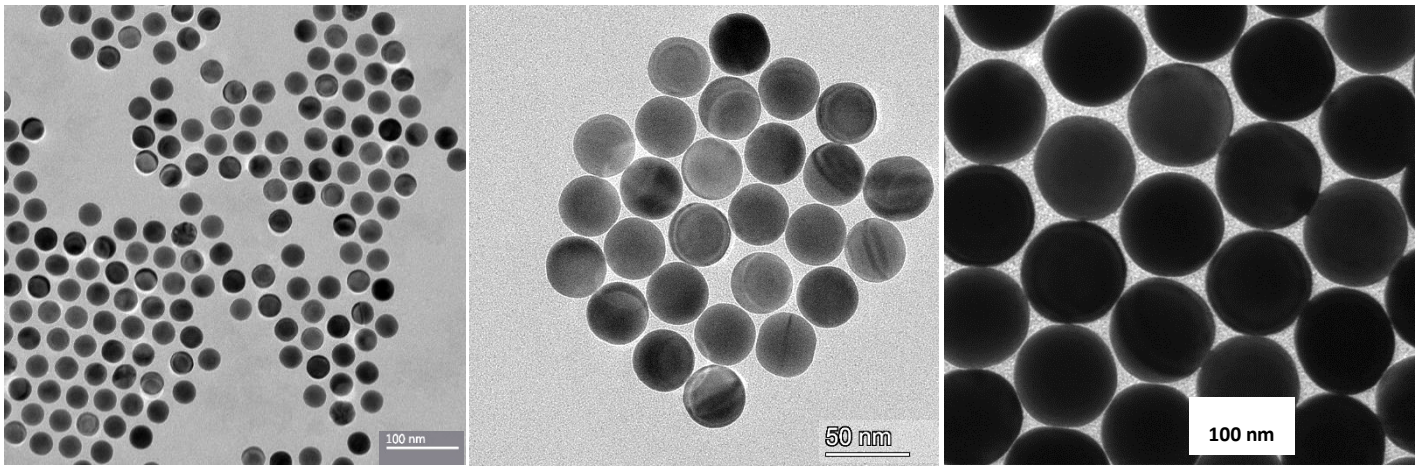
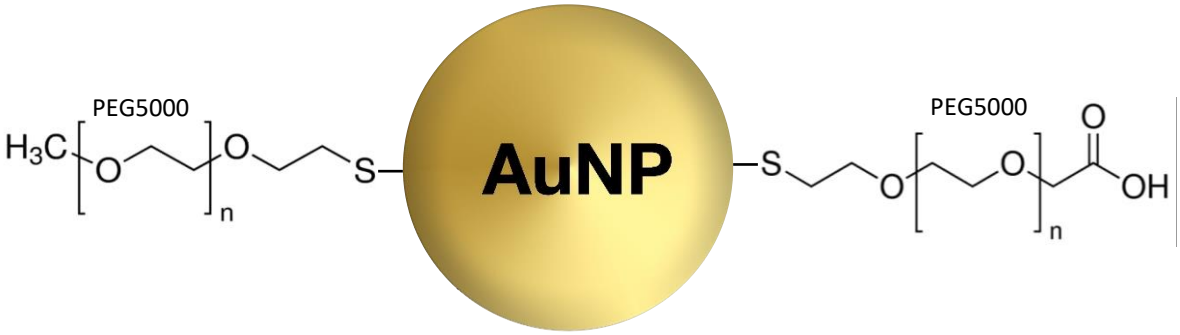


Ultra-monodisperse spherical Gold Nanoparticles, CV < 3%

solvents, including pH and high salt stability, and preventing nonspecific protein adsorption. PEG-carboxylated surface enables covalent binding with free amines, thus allowing conjugation of amine-containing proteins and biomolecules to the surface of gold nanoparticles. Thus, gold nanospheres with PEG-carboxylated surface can be used to prepare stable conjugates via EDC/NHS coupling. Our ultra-monodisperse gold nano-spheres are available in following sizes: 5nm (CV≤ 7%), 10nm (CV≤ 5%) and 15nm, 20nm, 30nm, 40nm, 50nm, 60nm, 70nm, 80nm (CV ≤ 3% for all sizes) at OD = 1, and OD = 3. Customized diameters/concentrations/PEG spacer sizes are available on request. We also offer non-PEGylated ultra-monodisperse nanoparticles in the same range of sizes and concentrations, which have positively charged CTAC surface, and can be used for standardization and control of the nanoparticles parameters.



Gold nano-sphere with PEG5000-methoxylated (left) and PEG5000-carboxylated (right) surface coating

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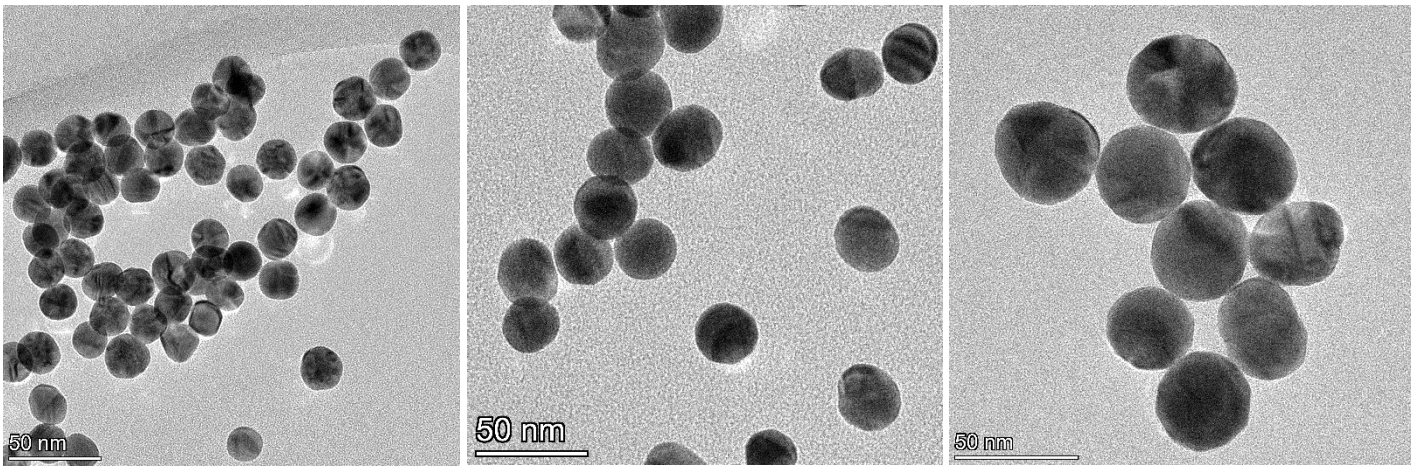
05

GOLD NANO-SPHERES “LATERAL-FLOW-EASY”

This type of gold nano-spheres represents an economic solution for the nanoparticles to be used as biosensors in various quick-tests, also called Lateral Flow Assays (LFA). For these applications, we offer gold nanoparticles in most commonly used sizes (20nm, 30nm, 40nm and 80nm), provided at highest concentration OD=20. These nanoparticles are characterized by spherical form and an absence of sharp edges and odd shapes, thus offering an ideal surface for modification. To be easily adaptable to various applications, we offer ‘’lateral-flow-easy’’ nanoparticles both with citrate surface and also having PEG5000-carboxylated surface coating. Accordingly, our citrate-coated gold nanospheres can be used when an easy replacement of the surface coating by passive adsorption is required, and the carboxylated surface can be used for direct conjugation of the antibodies, providing gold nanoparticles with specific recognition properties.



“Lateral-flow-easy” Gold Nano-spheres with the diameters of 20nm, 30nm and 40nm

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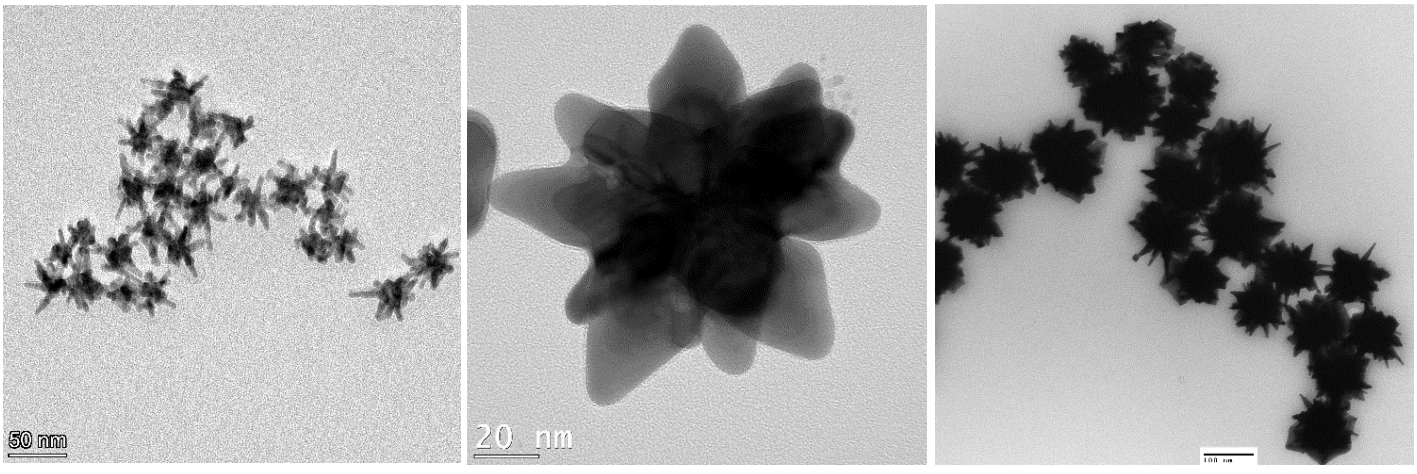
06

GOLD NANO-STARS

Gold nano-stars are specially designed for the applications where high surface area, spiky surface and high electromagnetic enhancement are required. Our smallest nanostars have the core diameter of 25nm, which is the smallest size available on the market. By changing core diameter to branch length ratio, we can create customized nanostars products.

The peak absorbance of our nanostars lies in the range of 560-1000nm. The nanostars are distributed in water, with the surface coating available in chitosan, PVP, PVA, BPEI and beta-CD, at OD=1, 3 and 5. Customized diameters/ concentrations/ surface coatings are available on request.



Gold Nano-stars with different shapes

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NANOPARTICLES CHARACTERISATION SERVICES

07

TEM NANOPARTICLES ANALYSIS

The images are taken with T*ransmission Electron Microscope Thermo Scientific TALOS F200X* operating at the accelerating voltage of 200kV with 2048-megapixel camera. The images are then analyzed to evaluate nanoparticles mean size and standard deviation. High-resolution imaging is available as well as the compositional analysis and elemental mapping by *Energy-Dispersive X-ray spectroscopy (EDS)*.

08

ICP-MS ANALYSIS

The concentration of metals is analyzed with *PerkinElmer NexION 2000P+ ICP-MS*. For the samples requiring digestion, the microwave-assisted digestion in *PerkinElmer Titan MPS 8* sample preparation system is performed, to assure complete dissolution. Separate analysis of the nanoparticles and the ionic fraction is performed by using *Single Particle Mode*, which also allows analyzing the mixtures of nanoparticles having different sizes and obtaining their number concentrations and size distributions based on ICP data.

09

DLS, ZETA-POTENTIAL AND UV-VIS ANALYSIS

DLS measurements of the hydrodynamic diameter of the nanoparticles in the solution and measurements of Zeta-potential, which characterizes the effective electric charge of the nanoparticles surface, are made with *Malvern Zetasizer*. UV-visible nanoparticles analysis is performed with *PerkinElmer Lambda365+* UV-Visible Spectrophotometer in the range of 200-1100nm in 1nm steps.

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ALL OUR PRODUCTS are made of 99.9999% pure gold and are accompanied by a lot-specific Certificate of Analysis (COA) which contains elemental analysis, TEM images, UV-vis spectra, size distributions and nanoparticles characteristics, such as number and molar concentration, nanoparticles mass, surface area, surface to volume ratio, etc.

Please CONTACT US for any products BEYOND OUR LIST you are interested to develop, as well as for the bulk orders.

NEW PRODUCTS are added continuously!

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