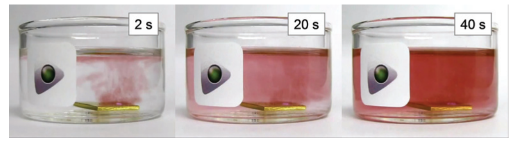
Reactant & Surfactant-free pure Nanoparticles via Laser Ablation

Particular
customized material

metals · inorganics · organometallics · catalysts · ligands · custom synthesis · cGMP facilities · nanomaterials

What is Laser Ablation?

Laser ablation is a physical process used to generate nanoparticles. It involves the use of short pulses of laser energy focused on a target in a solvent. The target absorbs the energy from the laser pulse and is vaporized. The vaporized material then condenses as nanoparticles.

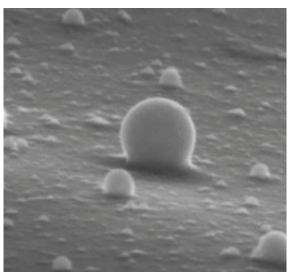


Basic process of pure, physical laser ablation in liquids, demonstrated at a gold foil in an open glass vessel. (For production, Particular uses ablation chambers instead)

Why Laser Ablation?

Laser ablation generates nanoparticle dispersions that are free of any contaminants, such as unreacted starting materials.

The use of short laser pulses makes it possible to carry out the ablation process in a wide range of carriers, including volatile organic solvents and reactive monomers. The laser technology also allows the conversion of almost any solid or powder material into a colloid. And that means that nearly endless material combinations are possible by varying the target and the solvent for screening studies and individual applications.



Nanoparticle from titanium

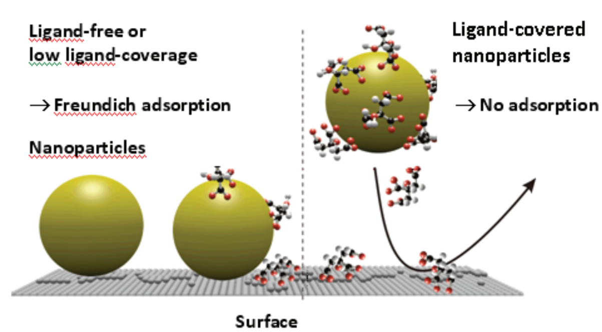
In addition, the released nanoparticles have a positive charge on the surface, and thus electrostatic stabilization by the surrounding medium occurs without the need, in most cases, for any type of chemical stabilizer.

The positive surface charge also provides a means for interaction with molecules that bear electron-donating substituents. In-situ functionalization is also possible with monomers, polymers and biomolecules. Deposition can also be achieved using electrophoresis.

In fact, laser-generated nanoparticles can be readily and permanently immobilized on micro- and nanoparticulate supports under ambient conditions without heat treatment. And because the nanoparticles are not covered with hydrophobic ligands, even water-insoluble supports like oxides, sulfates and phosphates can be used. Their high purity also means that supported catalysts prepared from laser-generated nanoparticles don't suffer from poisoning.

Advantages of Laser Ablation Generated Nanoparticles

- Very high purity – free of particle-associated residual chemicals
- High stability due to electrostatic stabilization (12 mo., 2mo. in H_20)
- High dispersibility
- Direct use of organic solvents
- Adjustable ion release rates
- Increase adsorption efficiency and reduced cost
- High bio-compatibility in different applications
- Higher reactivity and lower toxicity for medical/pharma applications



Courtesy University of Duisburg-Essen.

Laser ablation at a gold foil

Possible Applications for Ablation Generated Nanoparticles

- Biomedical, immunoassay, and toxicology studies
- Targeted drug delivery
- Supported heterogeneous catalysts
- Nanocoatings
- Nanocomposites

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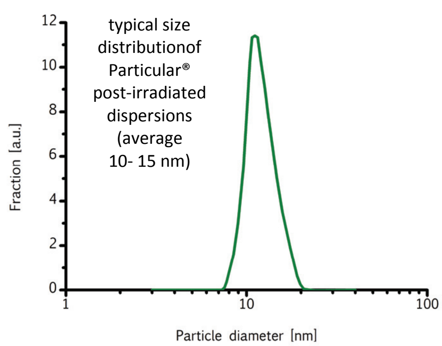
Selection Matrix for Nanoparticles prepared using Laser Ablation

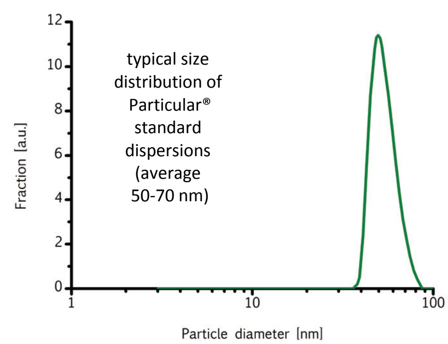
Strem offers a wide range of residue-free **nanoparticles** prepared via **Laser Ablation** by Particular GmbH.

Selection Matrix- pick element, size, concentration, solvent from available list

Element	Size		Concentration		Solvent			
	<20nm	50-70nm	100mg/L	500mg/L	water	acetone	Ethylene Glycol	iso propanol
Ag	x	x	x		x	x		50-70nm only
	x	x		x	x			
Au	x	x	x		x	x	x	x
	x	x		x	x			
Pt	x	x	x		x	x	50-70nm only	x
	x	x		x	x			
Pd	x	x	x		x	x	50-70nm only	
	x	x		x	x			
Rh	x	x	x		x	x	50-70nm only	x
	x	x		x	x			
Ru	x	x	x		x	x	50-70nm only	x
	x	x		x	x			
Cu	x	x				x	50-70nm only	
Ti	x	x				x	x	50-70nm only

x = available   Stability: 12 months (2 month in water)





Nanoparticles from metals (silver, titanium, platinum, gold) in water

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STREM Reactant & Surfactant-free pure Nanoparticles via Laser Ablation

Particular customized material

Cat. No.	Description
79-0410	Gold nanoparticles, pure, (<20nm) in water at 100mg/L (surfactant and reactant-free, OD>1, stabilized with < 0.01 mmol/l of citrate)
79-0412	Gold nanoparticles, pure, (<20nm) in acetone at 100mg/L (surfactant and reactant-free)
79-0414	Gold nanoparticles, pure, (<20nm) in ethylene glycol at 100mg/L (surfactant and reactant-free)
79-0416	Gold nanoparticles, pure, (<20nm) in isopropanol at 100mg/L (surfactant and reactant-free)
79-0418	Gold nanoparticles, pure, (<20nm) in water at 500mg/L (surfactant and reactant-free, OD>5, stabilized with < 0.01 mmol/l of citrate)
79-0420	Gold nanoparticles, pure, (50-70nm) in water at 100mg/L (surfactant and reactant-free, OD>1, stabilized with < 0.01 mmol/l of citrate)
79-0422	Gold nanoparticles, pure, (50-70nm) in acetone at 100mg/L (surfactant and reactant-free)
79-0424	Gold nanoparticles, pure, (50-70nm) in ethylene glycol at 100mg/L (surfactant and reactant-free)
79-0426	Gold nanoparticles, pure, (50-70nm) in isopropanol at 100mg/L (surfactant and reactant-free)
79-0428	Gold nanoparticles, pure, (50-70nm) in water at 500mg/L (surfactant and reactant-free, OD>5, stabilized with < 0.01 mmol/l of citrate)
47-0710	Silver nanoparticles, pure, (<20nm) in water at 100mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
47-0712	Silver nanoparticles, pure, (<20nm) in acetone at 100mg/L (surfactant and reactant-free)
47-0718	Silver nanoparticles, pure, (<20nm) in water at 500mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
47-0720	Silver nanoparticles, pure, (50-70nm) in water at 100mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
47-0722	Silver nanoparticles, pure, (50-70nm) in acetone at 100mg/L (surfactant and reactant-free)
47-0726	Silver nanoparticles, pure, (50-70nm) in isopropanol at 100mg/L (surfactant and reactant-free)
47-0728	Silver nanoparticles, pure, (50-70nm) in water at 500mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
78-1402	Platinum nanoparticles, pure, (<20nm) in water at 100mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
78-1404	Platinum nanoparticles, pure, (<20nm) in acetone at 100mg/L (surfactant and reactant-free)
78-1408	Platinum nanoparticles, pure, (<20nm) in isopropanol at 100mg/L (surfactant and reactant-free)
78-1410	Platinum nanoparticles, pure, (<20nm) in water at 500mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
78-1412	Platinum nanoparticles, pure, (50-70nm) in water at 100mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
78-1414	Platinum nanoparticles, pure, (50-70nm) in acetone at 100mg/L (surfactant and reactant-free)
78-1416	Platinum nanoparticles, pure, (50-70nm) in ethylene glycol at 100mg/L (surfactant and reactant-free)
78-1418	Platinum nanoparticles, pure, (50-70nm) in isopropanol at 100mg/L (surfactant and reactant-free)
78-1422	Platinum nanoparticles, pure, (50-70nm) in water at 500mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)

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Strem Nanoparticles prepared via Laser Ablation

Cat. No.	Description
46-4010	Palladium nanoparticles, pure, (<20nm) in water at 100mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
46-4012	Palladium nanoparticles, pure, (<20nm) in acetone at 100mg/L (surfactant and reactant-free)
46-4018	Palladium nanoparticles, pure, (<20nm) in water at 500mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
46-4020	Palladium Palladium nanoparticles, pure, (50-70nm) in water at 100mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
46-4022	Palladium nanoparticles, pure, (50-70nm) in acetone at 100mg/L (surfactant and reactant-free)
46-4024	Palladium nanoparticles, pure, (50-70nm) in ethylene glycol at 100mg/L (surfactant and reactant-free)
46-4028	Palladium nanoparticles, pure, (50-70nm) in water at 500mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
45-1322	Rhodium Rhodium nanoparticles, pure, (<20nm) in water at 100mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
45-1324	Rhodium nanoparticles, pure, (<20nm) in acetone at 100mg/L (surfactant and reactant-free)
45-1328	Rhodium nanoparticles, pure, (<20nm) in isopropanol at 100mg/L (surfactant and reactant-free)
45-1330	Rhodium nanoparticles, pure, (<20nm) in water at 500mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
45-1332	Rhodium nanoparticles, pure, (50-70nm) in water at 100mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
45-1334	Rhodium nanoparticles, pure, (50-70nm) in acetone at 100mg/L (surfactant and reactant-free)
45-1336	Rhodium nanoparticles, pure, (50-70nm) in ethylene glycol at 100mg/L (surfactant and reactant-free)
45-1338	Rhodium nanoparticles, pure, (50-70nm) in isopropanol at 100mg/L (surfactant and reactant-free)
45-1340	Rhodium nanoparticles, pure, (50-70nm) in water at 500mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
44-2810	Ruthenium nanoparticles, pure, (<20nm) in water at 100mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
44-2812	Ruthenium nanoparticles, pure, (<20nm) in acetone at 100mg/L (surfactant and reactant-free)
44-2816	Ruthenium nanoparticles, pure, (<20nm) in isopropanol at 100mg/L (surfactant and reactant-free)
44-2818	Ruthenium nanoparticles, pure, (<20nm) in water at 500mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
44-2820	Ruthenium nanoparticles, pure, (50-70nm) in water at 100mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
44-2822	Ruthenium nanoparticles, pure, (50-70nm) in acetone at 100mg/L (surfactant and reactant-free)
44-2824	Ruthenium nanoparticles, pure, (50-70nm) in ethylene glycol at 100mg/L (surfactant and reactant-free)
44-2826	Ruthenium nanoparticles, pure, (50-70nm) in isopropanol at 100mg/L (surfactant and reactant-free)
44-2828	Ruthenium nanoparticles, pure, (50-70nm) in water at 500mg/L (surfactant and reactant-free, stabilized with < 0.01 mmol/l of citrate)
29-0092	Copper nanoparticles, pure, (<20nm) in acetone at 100mg/L (surfactant and reactant-free)
29-0096	Copper nanoparticles, pure, (50-70nm) in acetone at 100mg/L (surfactant and reactant-free)
29-0098	Copper nanoparticles, pure, (50-70nm) in ethylene glycol at 100mg/L (surfactant and reactant-free)
22-0192	Titanium nanoparticles, pure, (<20nm) in acetone at 100mg/L (surfactant and reactant-free)
22-0194	Titanium nanoparticles, pure, (<20nm) in ethylene glycol at 100mg/L (surfactant and reactant-free)
22-0196	Titanium nanoparticles, pure, (50-70nm) in acetone at 100mg/L (surfactant and reactant-free)
22-0198	Titanium nanoparticles, pure, (50-70nm) in ethylene glycol at 100mg/L (surfactant and reactant-free)
22-0203	Titanium nanoparticles, pure, (50-70nm) in isopropanol at 100 mg/L (surfactant and reactant-free)

References:

1. Wagener, P.; Barcikowski, S.; Bärsch, N.: Fabrication of nanoparticles and nanomaterials using laser ablation in liquids. In: Photonik international I/2011.
2. Wagener, P.; Schwenke, A.; Barcikowski, S.: How Citrate Ligands Affect Nanoparticle Adsorption to Microparticle Supports. In: Langmuir 28 (2012), pp. 6132-6140.
3. Sajti, C. L.; Sattari, R.; Chichkov, B. N.; Barcikowski, S.: Gram Scale Synthesis of Pure Ceramic Nanoparticles by Laser Ablation in Liquid. In: Journal of Physical Chemistry C 114 (2010), 6, pp. 2421–2427.
4. Petersen, S.; Barcikowski, S.: Conjugation Efficiency of Laser-Based Bioconjugation of Gold Nanoparticles with Nucleic Acids. In: The Journal of Physical Chemistry C 113 (2009), 46, pp. 19830-19835.

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