



Customized Nanoparticles & Dispersions



nanograde[®]



About Us

Nanograde Llc.

is a high-tech spin-off company of ETH Zurich. The company offers the customized development and production of nanoparticles and dispersions. In addition to the on-demand production of nanoparticles and dispersions, Nanograde offers assistance in product or prototype development in the form of projects where Nanograde's customers can benefit from the extensive know-how in nanoparticle applications.

ETH Science City

Our offices are currently situated at Technopark in Zurich and in the heart of Science City at ETH Hönggerberg, just outside the city of Zurich, on a modern university campus. This gives us the possibility to collaborate with the brightest researchers from the fields of chemistry, biology, physics and material science on a daily basis and to access top-notch analytical instruments. This accelerated knowledge generation forms the perfect basis for tomorrow's innovations.

Capabilities

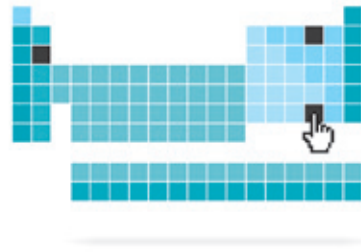
With years of experience in the synthesis and application of nanoparticles, nanograde Llc. is the preferred partner for nanoparticle solutions. We have international customers and project partners from a wide range of industrial fields.

With our patent protected technology and knowhow we can adjust our solutions to perfectly suit our customer's needs.

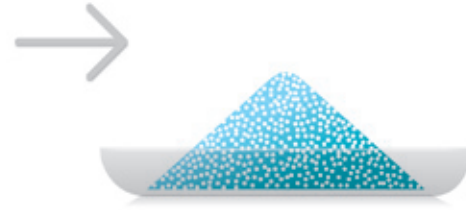
As a Switzerland based company we stand for 100% Swiss quality. We deliver rapidly, precisely and reliable.

We are committed to perform outstanding product development with our worldwide partner network. With years of experience to draw from, Nanograde can confidently handle most complex problem solving and challenging delivery goals.

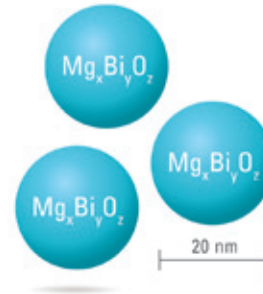
Customized Nanoparticles



Customize the nanoparticles.
Use our tool on www.nanograde.ch



We produce and deliver
Swiss quality nanoparticles



Each nanoparticle will have the same
composition and similar particle size

Examples

Li_2MoO_4
NaCl
 $NaBiO_3$
 $MgCO_3$
 $MgTiO_3$
 $AlPO_4$
 $AlCeO_3$
KCl
 K_2WO_4
 $CaCO_3$
 $Ca_3(PO_4)_2$
 Sc_2O_3
 V_2O_5
 CrF_3
 $MnMoO_4$
 $FeTiO_3$
 $FePO_4$
 $Co_{0.5}Zn_{0.5}Fe_2O_4$

$NiCr_2O_4$
 CuF_2
 $ZnMoO_4$
 Ga_2O_3
 GeO_2
RbF
 $SrSiO_3$
 $Y_2Eu_2O_3$
YSZ
 Nb_2O_5
 MoO_3
Pt-Rh on support
 Ag_3PO_4
ITO
 $SnSO_4$
ATO
 $BaZrO_3$
 $YBa_2Cu_3O_{(7-x)}$

$LaAlO_3$
 $CeVO_4$
 Pr_6O_{11}
 $NdCaAlO_4$
 $Sm_{0.5}Sr_{0.5}CoO_3$
 $Gd_3Ga_5O_{12}$
 TbF_3
 $DyScO_3$
 Er_2O_3
 Tm_2O_3
 HfO_2
 WO_2
Pt on Ce_xZrO_y
Au on $BaTiO_3$
 $PbWO_4$
BiOCl

Swiss technology

Nanograde's technology permits the creation of inorganic nanoparticles with customized compositions. Our technology is the most versatile in the field. It is highly reproducible with ultra-high phase purity. Exactly Swiss quality!

We are able to produce any simple single oxides, but also complex mixed oxides with up to 15 different metals. In addition to the oxides we are capable of synthesizing many different salt compositions like sulfates, phosphates, carbonates, chlorides, fluorides etc.

Specifications

Customized composition

Pick your specific composition and we will synthesize it only for you.

Customized particle size

The particle size of all compositions can be fine tuned between 5 nm and 100 nm.

Customized quantities

Although we are able to synthesize kilogram quantities, the typical first order size for a new composition is 1-10 gms.

Nanoparticles Applications



Dry nanoparticles



We produce and deliver
Swiss quality nanoparticles



Nanoparticle dispersion
for industrial processing

Products

- Adhesives
- Analytical liquids
- Antimicrobial coatings
- Biointerfaces
- Ceramic thin sheets
- Filtration membranes
- Fuel cell layers
- Fuel cell electrodes
- Hole injection layers
- Inks
- Lacquers
- Optical coatings
- Optical liquids
- Organic electronics
- Polymer coatings
- Solid polymer fuel cell
- Thin films

Industrial Processing

- Blade coating
- Dip-coating
- Dip-spin coating
- Flow coating
- Inkjet printing
- Offset printing
- Pad printing
- Roll coating
- Roll-to-roll coating
- Screen printing
- Spin-coating
- Spray-coating

Industries

- Aerospace
- Automotive
- Analytics
- Civil Engineering
- Coatings
- Communications
- Computer & IT
- Electrical Engineering
- Energy
- Medical
- Packaging
- Printing
- Solar
- Textile

Nanoparticle processing

It is rare that nanoparticles are applied as such. In most cases nanoparticles need to be transferred into a different system that facilitates the application or the industrial processing.

One of the common ways allowing a straight forward transfer of nanoparticle properties onto a product is via nanoparticle dispersions or suspensions. Depending on the final application process the solvent properties need to be chosen carefully. Water based systems, solvents with low evaporation temperature as well as more viscous liquids are possible.

Nanoparticle dispersions

Pure nanoparticle thin films

Can be processed via water- or solvent-based dispersions. Typical film thickness: 10 nm - 10 microns.

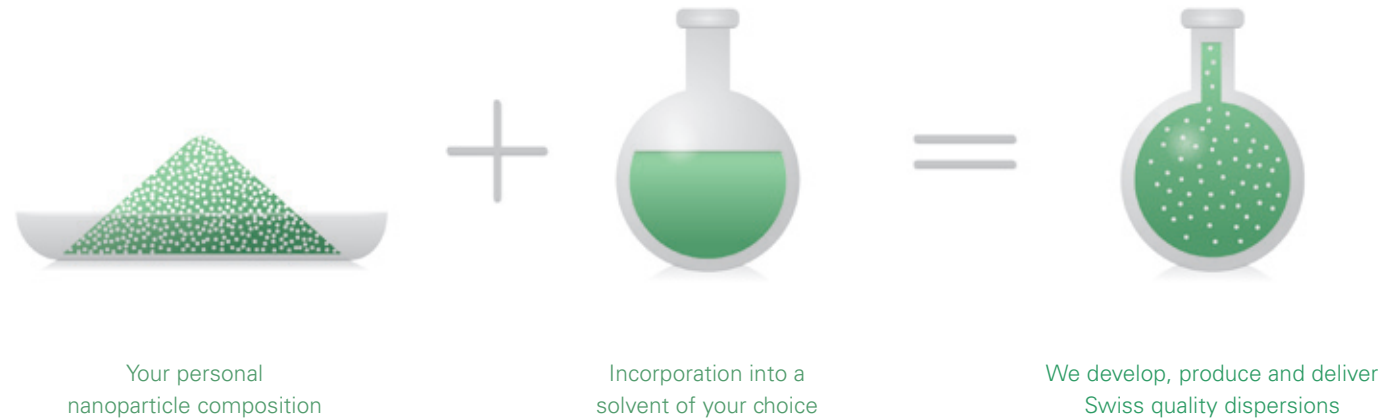
Polymeric coatings

Existing polymer coating systems can be equipped with nanoparticles. Processing unchanged.

Liquid nanoparticle dispersions

Up to 50 wt% nanoparticle content in any given solvent.

Customized Dispersions



Nanoparticles

ATO
BaSO₄
BiOCl
CaCO₃
Ca₃(PO₄)₂
Co_{0.5}Zn_{0.5}Fe₂O₄
FePO₄
ITO
Li₂MoO₄
MoO₃
WO₃
Y₂Eu₂O₃
YBa₂Cu₃O_(7-x)
YSZ
ZnO
etc.

Solvents

Acetone
Benzene
Cyclohexanone
DMSO
Diethyl ether
Ethanol
GBL
Hexane
Isopropanol
THF
Toluene
Water
Xylene
etc.

Industrial Processing

Blade coating
Dip-coating
Dip-spin coating
Flow coating
Inkjet printing
Offset printing
Pad printing
Roll coating
Roll-to-roll coating
Screen printing
Spin-coating
Spray-coating

Swiss technology

Besides the unique selection of Nanograde's customized inorganic nanoparticles we have unrivaled experience and knowhow in transferring nanoparticle properties to any solvent system. We are able to disperse our nanoparticles in any given solvent by the use of many different dispersion technologies. We can therefore offer you the highest possible freedom of operation.

Whatever your application is, we analyze your situation and develop the best possible solution for you. Whether by the use of surfactants, dispersing agents or not; we customize our products to your needs and deliver in Swiss quality!

Specifications

Customized composition

Pick your specific composition and particle size and we will develop and synthesize it just for you.

Customized solvent

Choose from any solvent ranging from water, alcohols or aliphatics.

Further options

Nanoparticle loading, optical properties, processability and many more...

Dispersions Applications



Products

- Adhesives
- Analytical liquids
- Antimicrobial coatings
- Biointerfaces
- Ceramic thin sheets
- Filtration membranes
- Fuel cell layers
- Fuel cell electrodes
- Hole injection layers
- Inks
- Lacquers
- Optical coatings
- Optical liquids
- Organic electronics
- Polymer coatings
- Solid polymer fuel cell
- Thin films

Industrial Processing

- Blade coating
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- Flow coating
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- Screen printing
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- Spray-coating

Industries

- Aerospace
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- Communications
- Computer & IT
- Electrical Engineering
- Energy
- Medical
- Packaging
- Printing
- Solar
- Textile

Implementation

The concept of nano property transfer into industrial products is simple - its technical solution is not. We at Nanograde have very strong knowhow in transferring specific properties into final products. Depending on your existing or envisioned production process we develop a customized solution for you adapting our process parameters. Our solution-based coating technology is perfectly suited for continuous high-capacity production like roll-to-roll coating or printing.

Final product

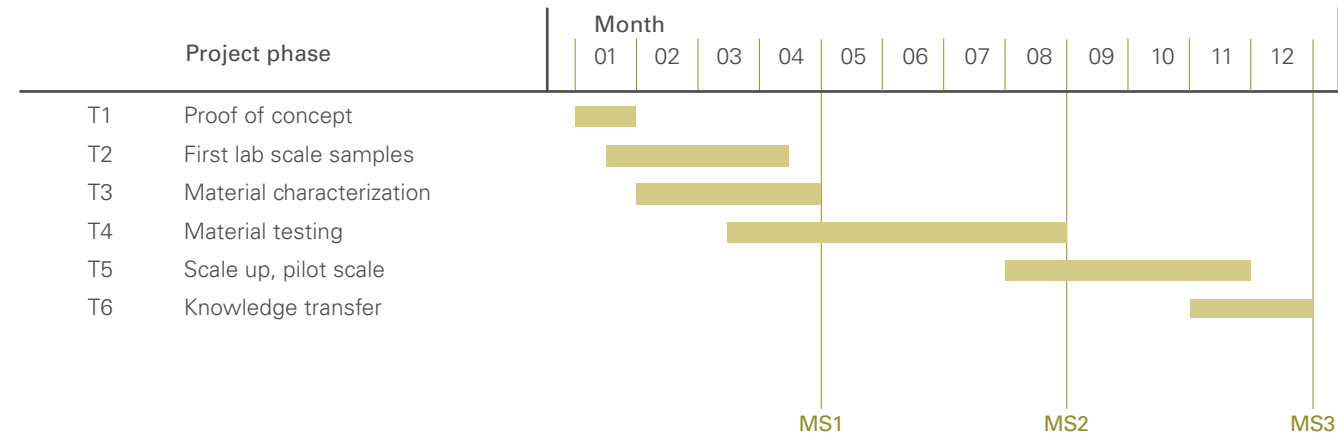
Pure nanoparticle thin films
Can be processed via water- or solvent-based dispersions. Typical film thickness: 10 nm - 10 microns.

Polymeric coatings
Existing polymer coating systems can be equipped with nanoparticles. Processing remains unchanged.

Liquid nanoparticle dispersions
Up to 50 wt% nanoparticle content in any given solvent.

Innovate your products

Project Management



Industry innovation

Where can our technology innovate? The variety of potential industries and products is immense. Even industries that seem to show no overlap can potentially be innovated.

Do not be shy of talking about your ideas! Our technical knowhow and experience will quickly separate the wheat from the chaff. Usually, a five minute conversation on the phone is already sufficient to evaluate the potential crossover between your products and our technology.

A possible overlap can then be assessed in a more detailed brainstorming meeting. Based on the shared ideas we will be able to formulate a project proposal with clear goals and timeline. In most cases we include a quick proof-of-concept milestone. If the proof-of-concept is not achieved you will have the opportunity to drop out of the project.

We welcome potential partners from any industry to jointly evaluate problem solving and/or prototype development. Typical projects have a time frame of 3-12 months.

Contact us for more information.



Case studies

Case study 1

Industry
Solar cells.

Field
Printable electronics.

Product
Molybdenum oxide thin film.

Problem
Costly batch processing of thin film.

Innovation potential
Replacing current high vacuum thin film deposition by a continuous large scale process.

Solution
Development of a molybdenum oxide dispersion suitable for roll-to-roll coating and printing.

Result
Performance of dispersion-derived molybdenum oxide films is equal to vacuum deposited films.

Case study 2

Industry
Industrial lasers.

Field
High power solid state lasers.

Product
Transparent neodymium oxide laser medium.

Problem
Insufficient cooling of state-of-the-art solid laser media.

Innovation potential
Replacing current solid laser media by a liquid neodymium oxide dispersion allowing fast cooling.

Solution
Development of a neodymium oxide dispersion with sufficient stability and transparency.

Result
Neodymium oxide dispersion with a particle size of < 10 nm. Dispersion is fully transparent.

nanograde Llc.

customized nanoparticles & dispersions

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