

Glass beads



INTRODUCTION

Since 50 years, Sovitec is the pioneer and the leader in Europe in the production of glass beads. Sovitec's glass micro beads have a diameter between a few microns and several millimetres.

Sovitec employs 150 people and has customers in 60 countries worldwide. Sovitec focuses on continuous improvement and innovation in its products and production processes.

CREAX is the reference in systematic innovation, problem solving and technology transfer.

Sovitec and CREAX jointly conducted an

innovation study to map new applications for the Sovitec glass beads technology. The main applications are highlighted in this brochure, structured according to the specific properties.

Explore this interesting product and do not hesitate to contact us for additional information.

Sovitec & CREAX

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MAIN PROPERTIES OF GLASS BEADS

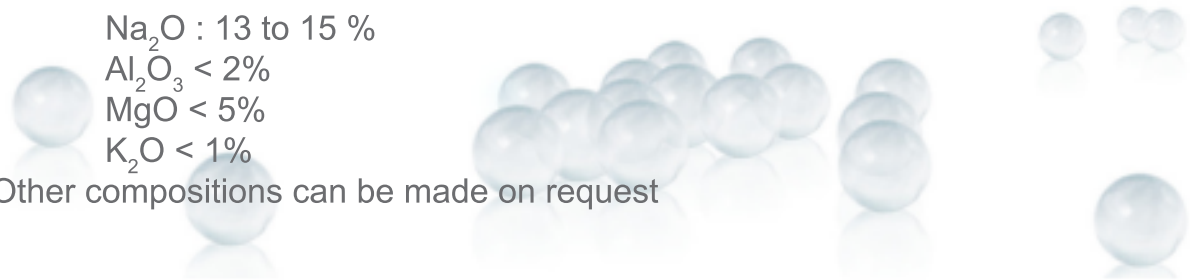
- different particle size distribution
- spherical
- smooth
- uniform diameter
- transparent
- light reflective
- hard
- inert
- colour
- abrasion resistant
- hydrophilic
- lubricity
- fluidity
- slippery
- dimensional stability
- customizable surface
- physical versus chemical properties

APPLICATIONS TODAY

road markings
surface treatment by impact
fire fighting
cleaning building stones
reinforcement of resins
telecommunications

TECHNICAL SPECIFICATIONS

- Spherical shape with smooth surface
- Real density: 2.46 kg/dm³
- Apparent density: 1.5 -1.6 kg/dm³
- Hardness : 5.6 Mohs / 47 HRc / Knoop (100g) 1.5 to 1.6
- Regular composition:
 - SiO₂ : 70 to 75 %
 - CaO : 7 to 11%
 - Na₂O : 13 to 15 %
 - Al₂O₃ < 2%
 - MgO < 5%
 - K₂O < 1%
- Other compositions can be made on request



PROPERTIES



SIZE

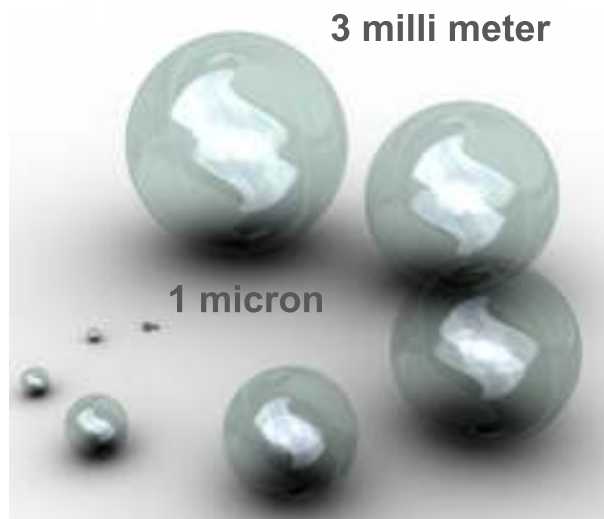
The glass beads produced by Sovitec are available in a range of different sizes. The smallest glass beads have a diameter of 1 micron and the biggest have a diameter of 3 millimeters. Each size corresponds to specific functions and applications. Sovitec can also provide any particle size distribution (PSD), from very narrow to wide. It matters because a large PSD results in a higher packing factor. For instance, the glass beads density goes from 1.5 to 2.5 depending on the size and the PSD. By carefully choosing these parameters, one can easily finetune properties like surface area, void content and fluidity.

This is of high importance for applications such as filtration: the size from which unwanted materials would be blocked depends on glass beads size and PSD. The pressure drop, or resistance to flow,

is also influenced by these parameters. The glass beads filtration performance can be useful for aquaria, ponds, pools in domestic or industrial application, water treatment, drainage material for landscaping, tennis courts, sport field, playgrounds, roofs, filters in pharmaceutical processes, etc...

The glass beads could also serve as a substrate media for growing plants without soil (hydroponics), landscaping for golf courses, roofs, aerating media for potted plants, laboratory distillation columns, pouring media, dispersible granular substrates for pesticide delivery, cultivation supports for mussels water filtering.

Size range



POSSIBLE APPLICATIONS

Filtration

- aquaria
- ponds
- pools in domestic or industrial applications
- water treatment
- drainage material for landscaping
- tennis courts
- roofs
- filtering in pharmaceutical processes

Substrate

- hydroponic systems
- landscaping for golf courses, roofs, etc
- aerating medium for potted plants





SHAPE

Perfect spheres

Glass beads are used for prestressing shot-blasting using wet or dry methods. The aim of this process is to increase the mechanical resistance of the items subjected to the treatment and to improve their life span. There is no chemical contamination of the pieces so there is no need for any subsequent decontamination stage. Moreover, the round shape also imparts crush resistance, thus it is no surprise that glass beads are used to grind materials, such as vegetable products.



Fluidity

Because of the spherical shape the glass beads act as a flow of viscous liquid; they adapt to all *difficult to access* shapes and can be used to clean hollow articles. The glass beads can be recovered, cleaned and reused. Due to their compressive strength they strike the contamination particles and can be used in combination with a pressurized liquid. When incorporated into a resin or a slurry, glass beads impart easier applications and processes.



Gentle cleaning

Adding granules to detergents is a well known technique for cleaning. In most of the known technologies the granules consist of the detergent itself pressed into the solid state. Glass beads could take over the benefits of the granules like hitting the dirt. The smooth surface of the glass beads, ensures that

machines won't be damaged. Moreover the accessibility of the surfaces which need to be cleaned will increase. It is even possible to decrease the cleaning temperature by using glass beads instead of conventional detergent granules.

POSSIBLE APPLICATIONS

Perfect spheres

- shot-blasting

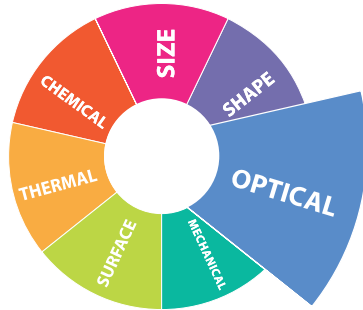
Fluidity

- cleaning of hollow articles like pipes and machinery
- cleaning additive for detergents

Gentle cleaning

Additive for easy application

- painting
- flooring
- filler



OPTICAL

Reflection

One layer of glass beads can irregularly reflect light, causing the surface underneath to maintain colour yet appear glittered or mat, depending on the bead size. Multiple layers cause interference and produce direction dependent colour effects.

This property is useful in a broad range of products increasing visibility and safety. Since the drivers' vision of the



Glass beads in paint for road markings

road in the night is mainly due to the retro-reflection of the car lights on the road markings, Sovitec has developed new types of coated glass beads with a larger diameter up to 2 mm which will remain over the outflow of water under rainy conditions providing the drivers with enough visibility to carry on driving in a safe way.

Diffusion

Light diffusing material (like glass beads) softens directional light by scattering. The resulting beam appears softer and more general, with shadows lessened or even completely absent. It looks more natural and more like daylight. It flatters subjects by diplomatically suppressing pits and cracks. Based on this property the beads can be used in car light housings, LCD and LED screens but also in personal health care for shine control creams.

Refraction

Refraction occurs when light waves travel from a medium with a given refractive index to a medium with another at a determined angle. A glass bead layer could be sprayed on transparent layers to secondly refract the light. E.g.: beamer lens, flat screens, LED lighting.

POSSIBLE APPLICATIONS

Reflection

- road markings
- pearlescent paint and ink
- car parts
- make-up
- party decoration
- safety wear

Diffusion

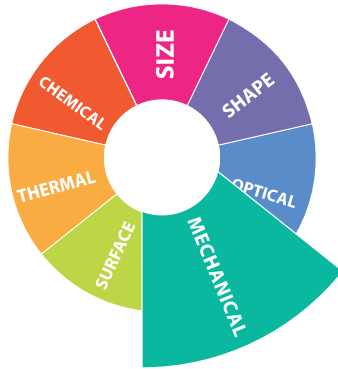
- LCD & LED lighting
- car light housing
- photography lighting
- shine control creams

Refraction

- LCD lighting
- beamer lens



Glass beads under red laser light



MECHANICAL

Compressive strength

Glass has a high intrinsic strength. Everybody has experienced how hard glass is, usually it is even harder than steel. Although glass is brittle in tension, it has outstanding compressive strength. Glass beads offer you the best of both worlds. They withstand high compression loads and the round shape also helps by spreading stress.

Scratch resistance

Due to its high hardness, glass beads have good scratch resistance. Embedded in a matrix, glass beads increase hardness and decrease wear through higher scratch resistance and lower friction. The round shape makes glass beads fully isotropic in 3D. Possible applications are: additive for release

coatings, increasing the coating lifetime, anti-scratch sunglasses, motorcycle fairing, sliding aid, artificial bones, solid hydraulic media, etc.

Abrasion resistance

Wax and polishes are mainly used to protect a surface and to make an object shiny. Glass beads have the benefit of being durable. Because of the small dimensions they are also extremely applicable for filling hair cracks in surfaces that need to be protected from moisture, to minimize the chance on corrosion or further cracking. For these reasons glass beads can be used as polish additive for vehicles, music instruments, skis, surf boards, floors, etc.

Lubrication

Solid lubricants are mostly integrated in applications where it is desirable to reduce the friction when metal contacts metal. Glass beads reduce the friction, increase the durability and create a smooth surface. Glass beads can be used as solid lubricant for conveyor and fitness belts, in transportation (automotive, trains and bikes) and as lubricant spray.

POSSIBLE APPLICATIONS

Scratch resistance

- additive for release coating
- increasing coating lifetime
- anti-scratch sunglasses
- motorcycling fairing
- sliding aid
- artificial bones
- solid hydraulic media

Abrasion resistance

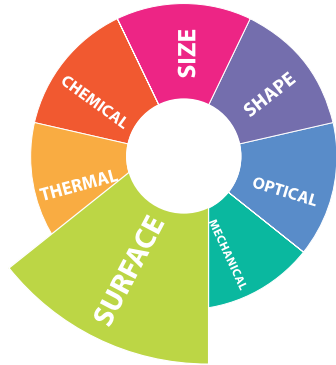
- polish additive for vehicles, skis, surf boards, floors, etc.
- solid lubricant for conveyor belts and fitness belts
- solid lubricant in transportation

Lubrication

- lubricant spray

Filler

- filler substrate in water



SURFACE

Smoothness & anti-stick

In the production of moulded parts smoothness of the surface is crucial for certain applications. Due to its surface properties glass beads can improve the smoothness of components used in air planes, sport vehicles and sport equipment.

But also in many household applications anti-stick properties are crucial for the good working. Examples are ceramic and induction cooking equipment, irons, barbecue grids, etc.

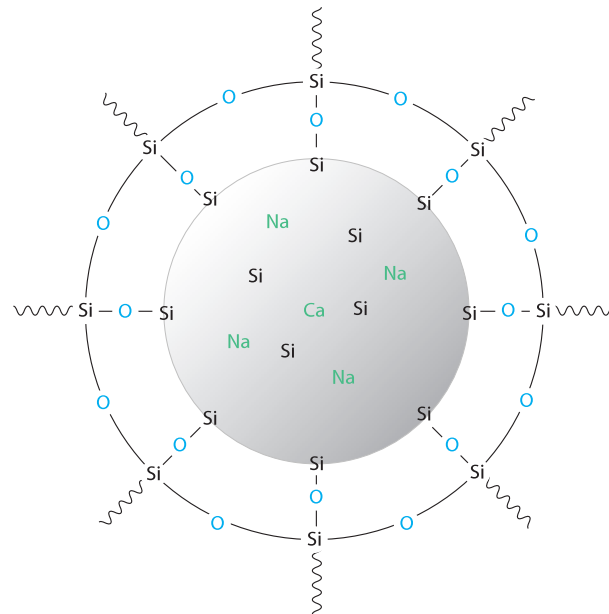
Film forming & coatings

Micro beads can form films on surfaces and may lower evaporation. They can also have a drying effect (desiccant). It is possible to create several coatings with

additional functions like self-cleaning, self-, etc.

Filler

Due to their mechanical and inertial properties, beads can be used as filler substrate in water. Fillers are mainly used as particles added to material to lower the consumption of more expensive binder material, to have better properties.



Absorption

Their surface is also responsible for the very low oil absorption coefficient (see table). Thus, without increasing the viscosity of the matrix, glass beads can be used as filler in paint, coatings for guide systems for doors, as coating in irrigation systems, conveyor belts, etc.

POSSIBLE APPLICATIONS

Smoothness & anti-stick

- air planes
- sport vehicles
- sport equipment
- ceramic cooking equipment
- induction cooking equipment
- irons
- barbecue grids

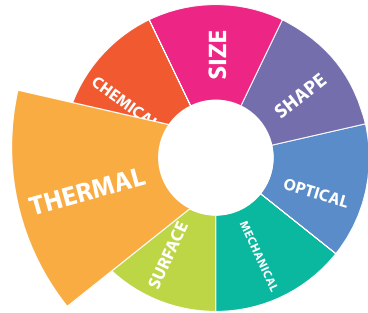
Film forming & coatings

- desiccant
- self-cleaning coating
- filler in coatings for guide systems for doors
- coating in irrigation systems
- coating for conveyor belts

Oil absorption coefficient

Filler	Size (µm)	OAC
Glass beads	0-50	17-20
CaCO ₃	0-30	20-30
Chalk	0.4-5	36-40
Mica	4-70	65-72
Talc	1.4-19	22-57

PROPERTIES



THERMAL

Low thermal expansion

Due to a low coefficient of thermal expansion, glass beads have an excellent dimensional stability to temperature exposure. Glass beads are of great help regarding to heat stress introduced during processing or product lifetime.

Glass beads also contribute to heat distribution, which limits failure caused by local overheating. The beads can be used as process aid in vulcanisation, thermal insulation, heat exchange, solid storage medium, faster process cycles.

Fire resistant

When exposed to fire, glass beads will not burn, generate toxic gas nor support flame propagation. They will eventually soften above 600°C.

Thus they can be used as fire resistant additive, i.e. in fire fighting apparatus or firemen equipment.

Large surface area

Having a large surface area, glass beads are useful for surface limited thermal processes. Glass beads are useful for distillation column or dry sterilization.



POSSIBLE APPLICATIONS

Low thermal expansion

- process aid in vulcanisation
- thermal insulation
- heat exchange
- solid storage medium
- faster process cycles

Fire resistant

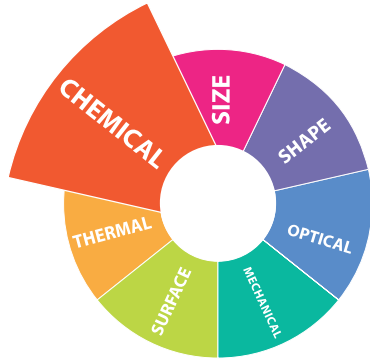
- fire resistant additive for fire fighting apparatus or firemen equipment

Large surface area

- dry sterilisation
- distillation columns



Glass beads have a large surface area



CHEMICAL

Inert

Inherently to the glass composition, glass beads are unaffected when subjected to varying conditions of light irradiation, moisture, chemical environment, temperature, pressure, or other stress. This property ensures glass beads will not chemically react and make it suitable for applications where stability in demanding conditions is needed. In addition, glass beads are biologically inert and absolutely non allergenic.

The chemical structure of the glass beads will also limit gas diffusion or improve gas barrier properties. The round shape allows a homogenous dispersion thus limits leakage or weak point. Gas barriers can be advantageously used in: food preservation, medicine containment, inflated bladders (tire, pressurized

container, balloon), electronics, etc.

Electrical insulator

As an electrical insulator, glass beads can be electrostatically charged to stick on surfaces or provide oil electrostatic filtration.

The glass beads' surface is also easily functionalized with a wide range of products, e.g. hydrophobic treatment, metal coating, releasable agent, etc. Surface properties can be tuned according to customer's requirements, for instance to make it compatible with any material.

Growing media

The Sovitec spheres can act as growing media, for plants and bacteria. Plants growing in this media can benefit from a better aeration, deeper root growth and improving air circulation. Other factors like an improved aesthetical look, the possibility for adding colour to the beads or coating them with minerals, give the beads superior properties. This glass beads media can be used in plants & garden soils, pot earth, modular plant systems, hydroponic systems.

POSSIBLE APPLICATIONS

Inert

- medicine containment
- food preservation
- electronics
- inflated bladders like tires, pressurized containers and balloons
- vulcanization process of tires, watches, rubber floor carpets, shoes, etc.
- donning powder for surgical gloves
- skin care
- cosmetics

Electrical insulator

- electrostatic filtration

Growing media

- plants & garden soils
- pot earth
- modular plant systems
- hydroponic systems
- bacteria
- microbiology
- pharmacy

OVERVIEW OF PROPERTIES AND APPLICATIONS

This figure shows an overview of the property-function relation of the glass beads with corresponding applications.



Sovitec is leader in the distribution of glass beads in Europe and has distributors all over the world.



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