



**Biosilico<sup>®</sup>**

# Oleophobic Silica

## Technical Overview & Application Guide

Better products. Better prices. Better life.





# About BSB Nanotech

Biosil is the world's first commercially produced bio-based amorphous silica manufactured with the highest degree of purity and synthesized for a wide range of applications.

Manufactured by BSB Nanotech in Vietnam, this silica is derived from Rice Husk (RH), a common agricultural waste in rice producing countries in Asia. The production of Biosil offers strong environmental, technical and commercial advantages in comparison with conventional methods of producing silica from sand & quartz

The vision of BSB Nanotech is to become a global producer and developer of premium industrial applications of RH-derived Nano Silica.

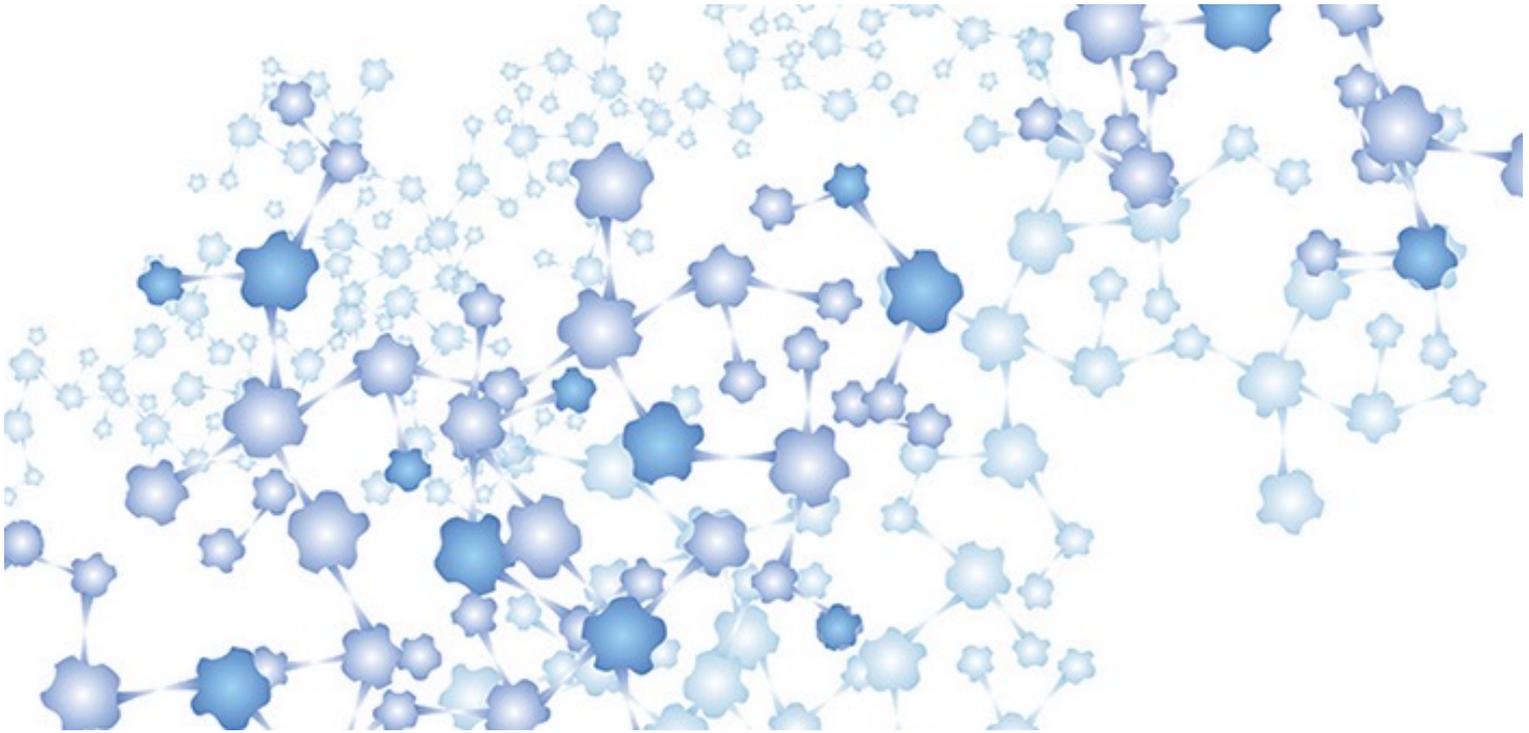
## Key Milestones

- April 2017: Investment License in Saigon Hi-Tech Park
- November 2018: Pilot Plant Completion
- December 2018: First Commercial Order
- February 2018: Nano Lab Completion
- March 2020: Plant Upgrade Completion
- Name change from BSB Development & Investment Co. Ltd to BSB Nanotechnology Joint Stock Company

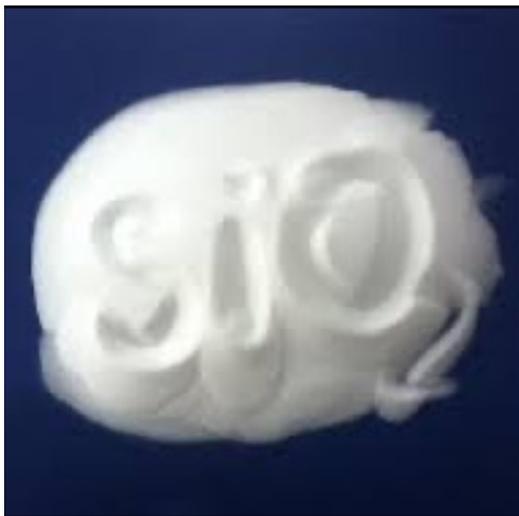
## Senior Management Team

- Hung Nguyen Viet, PhD, Founder & CEO
- Christopher Do, Chief Commercial Officer & Director





## Silica



**Natural Occurrence of Silica.** The two most abundant elements in the earth's crust are oxygen and silicon (46.6% and 27.7% by weight). In nature, silicon is almost always combined with oxygen. Either exclusively in  $\text{SiO}_2$  or in conjunction with additional elements (as is the case for silicates such as bentonites, montmorillonite, talc, wollastonite). The natural silicates form the basic raw material for key technical products such as cement, glass, porcelain, and bricks.

**Basic Manufacturing Process.** The silica is usually manufactured by both wet (chemical) and Thermal methods. The wet method yields precipitated/Colloidal Silica and silica gels, whereas the other method yields fumed Silicas, which can be further characterized to yield different grades of silica.





# The Bio-Silica Production Pioneer



**Asian countries** are predominantly rice producers with Vietnam being one of the top five in the world. The extraction of silica from this renewable resource has been endeavored by many scientists and researchers.

**Leading** this scientific race, BSB Nanotech is the first company to successfully produce rice husk based nanoporous silica on a commercial scale in the world.

**Strategically** located along the waterways of the Mekong Delta in Vietnam, BSB Nanotech has brought together the abundant access to rice husk, state-of-the-art technologies and skilled professionals to develop a cost effective nanoporous silica in its purest form.

**After four years** of extensive research, Biosil was formulated to perfection, harnessing the highest amorphous silica content from rice husk and customised for various applications.





# Oleophobic Silica

## Brief Overview

Our **Oleophobic silica** is an exclusive and high-end product that imparts excellent oleophobicity, superhydrophobicity and corrosion resistance combined for one application. Its appearance is a fluffy and off-white powder. Silica nanoparticles are hydrophilic in nature due to the presence of silanol groups, the surface of these particles undergo modification or treatment to achieve oleophobicity.

The oleophobicity is introduced into the hydrophilic silica by reacting its hydrophilic group-ends (silanol groups) with certain fluoroorganic groups (having REACH & TSCA registration).

These functionalized silane groups are introduced by reagents like organosilanes and/or selected from a group of fluoroorganosilanes. The organic groups get anchored on the hydrophilic silica surface through hydrolysis, followed by condensation reaction. This process produces an oleophobic surface on the silica particles.

No.	Parameters	Value
1	Particle Size	5 - 10 $\mu$
2	pH Value (5% dispersion)	5.5 to 7
3	Loss on Drying (2 hrs @ 105°C)	< 5%
4	Tamped Density (g/cc)	0.150 – 0.180
5	Percentage of SiO <sub>2</sub> (wt %)	≥ 99%
6	BET (m <sup>2</sup> /g)	



## INNOVATIVE TECHNOLOGIES

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# Applications

**Oleophobic silica** is a versatile industrial product that is utilized in nano-coatings that can prevent oils from adhering to any surface. The industries that it serves are wide such as paints & coatings, oil & gas industry, food processing, offshore platforms, inspection equipment and even used in vessels, pumps and valves. Products that adopt this hybrid technology helps prevent any surface to repel unwanted oils and viscous fluids as well as repel liquids due to its oleophobic and superhydrophobic nature.

Some of the key applications of Oleophobic silica covered in this guide includes:

- Oil & Gas (Offshore / Onshore refineries / Pipelines)
- Consumer Electronics Industry
- Medical Devices Industry
- Food Processing Industry





## Oil & Gas

For the Oil & Gas industry, oleophobic silica is a revolutionary additive due to the capability of producing oleophobic coatings that can repel organic compounds. This hybrid silica is used directly in most formulations as an additive offering the following benefits:

### Key benefits:

- Prevents contamination of coated substrate from any sort of oils or liquid
- Promotes anti-fouling properties due to its hydrophobicity
- Increases oil flow in pipeline and down well applications
- Reduces paraffin and asphaltene build-up in flow & immersion environments

### Recommended dosage:

4 – 10% on total Wt% solids





## Consumer Electronics

Touchscreens are aplenty in our current times, they range from smartphones to tablets and even laptop or monitor screens that are used heavily by people regardless of age. Most of these consumer electronic devices have screens that are coated with oleophobic coating during its manufacture. Using our surface treated silica nanoparticles, a barrier is created on the surface of the screen that has very low surface energy and which does not allow oils to “wet” the surface.

### Key benefits:

- Reduces natural fingerprint smudges (fingerprint resistant)
- Reduced screen glare which enhances visibility
- Prevents the device from getting wet from oils or liquids
- Provides a smooth screen surface for better utility

### Recommended dosage:

4 – 10% on total Wt% solids (Oleophobic nano silica to be used)





# Medical Devices

Oleophobic coatings are essential for a wide range of medical devices and equipment such as endoscope lenses, visors, surgical instrumentation, ultrasound equipment and medical tubings. The coatings bond to the surface due to the silica nano-particles that creates a barrier on the substrate whilst providing ever-lasting protection. The resulting oleophobic surface prevents oils from bonding to the surface and this makes it easy to remove the oils or fats without smearing it all over and thus creating a mess.

## Key benefits:

- Increase visibility for equipments such as visors and shields
- Induces non-stick characteristics in medical devices
- Enhances oleophobic and lipophobic properties in medical equipment & devices
- Efficient self-cleaning characteristics due to high superhydrophobicity

## Recommended dosage:

4 – 10% on total Wt% solids





## Food Processing

In the food processing industry, the equipment used faces the usual problems from other industries such as wear & tear, corrosion, contamination and many more. Due to being a highly consumer reliant industry, the equipment must be in top-notch condition and have properties such as self-cleaning and oleophobicity to reduce constant maintenance that can increase cost and manpower needed. Food & beverage manufacturers face incredibly tiresome sticky substances daily that reduce their production efficiency.

### Key benefits:

- Induces low friction in the substrate and repels oils
- Easy to clean surfaces
- Prevents clogs due to viscous fluids (syrup) that can halt production
- Eliminates problems that arise from sticky substances / adhesives

### Recommended dosage & Temperature range:

4 – 10% on total Wt% solids (Hybrid oleophobic silica can be used)



ARE YOU  
DRIVING  
**CHANGE**

**OR** ARE YOU  
BEING **DRIVEN**  
BY IT

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