



# **Biosil**<sup>®</sup>

Bio-based Silica  
from Rice Husk  
for Paints & Coatings

Better products. Better prices. Better life.





## About BSB Nanotech

Biosil represents a brand of Bio-based Silica derived from rice husk (RH) that is manufactured by BSB Nanotech. It is the world first commercially produced Bio Nanoporous Silica from a sustainable source. The production of Biosil from an agricultural waste 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 Rice Husk Silica.

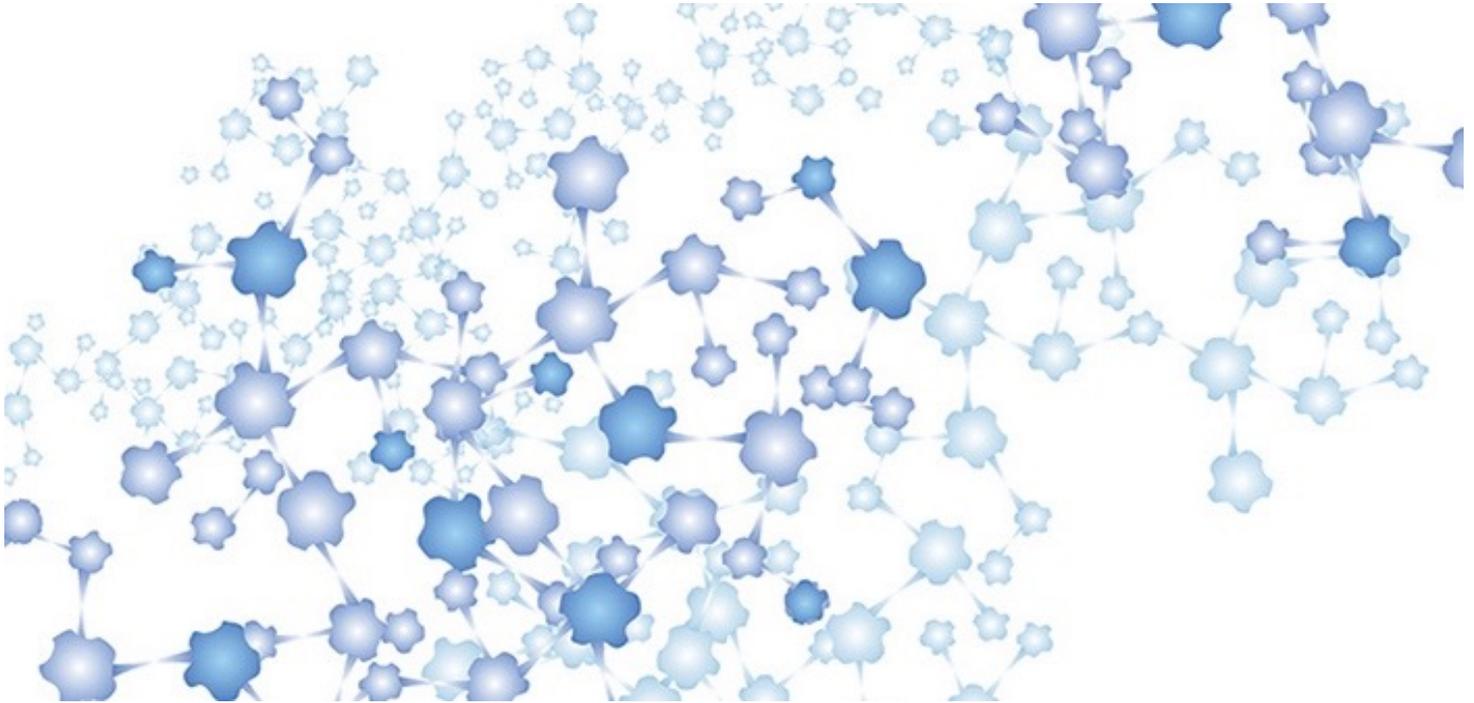
### Key Milestones

- April 2017: Investment License in Saigon Hi-Tech Park
- November 2018: Pilot Plant Completion
- December 2018: First Commercial Order
- February 2019: Nano Lab Completion
- March 2020: Plant Upgrade Completion
- April 2021: Name change from BSB Development & Investment Co. Ltd to BSB Nanotechnology Joint Stock Company

### Senior Management Team

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





## Bio-based Silica



**Nanosilica** or Silicon Dioxide nanoparticles ( $\text{SiO}_2$ ) is a marriage between nanotechnology and one of the most widely used and manufactured materials, silica.

**Silica** in its nano size has a range of advantages: large specific surface area and energy, strong surface absorption, high chemical purity and good dispersion. Due to its unique properties, nanosilica has established roles in the fields of physics, chemistry and biology.

**Thus**, nanosilica is applicable to a large and diverse range of industries, from construction to rubber and plastic additives, paints and coatings, medicine and cosmetics, and more. Nanosilica is a ubiquitous constituent in materials which are a part of our daily life.

**BSB** is the world first producer of Bio-based Nanoporous Silica from rice husk on an industrial scale with the Biosil Brand.





## The Sand Crisis & Solution

50 billion  
Tons/Year

**Growing** demands for nanosilica, in the face of diminishing virgin resources and the increase of excess waste, call for more sustainable production practices.

**Sand** is the third most used resource after air and water and is a prime constituent in silica production.

**50 billion tons** of sand is mined per annum leading to devastating ecological and sociological consequences.

**The Solution** for the aforesaid challenges was found by BSB's scientists with the use of rice husk ash instead of sand or quartz.





## From Ash to Cash



**Rice** is the second most consumed food, globally. Rice husk, which is the by-product of rice production, can be used as fuel in energy production. However, the result is rice husk ash, which is a waste.

**The use** of rice husk in the production of Bio-based nanoporous silica is a revolutionary technique in which waste is utilized to create a nanomaterial of high purity and value.

**Rice husk** ash is rich in amorphous silica, making it a highly customizable and sustainable source of silica. This conversion from ASH to CASH is an initiative in building a circular economy.

\*Annual Renewable Rice Husk Source in Vietnam





# The Rice Husk Silica Production Pioneer



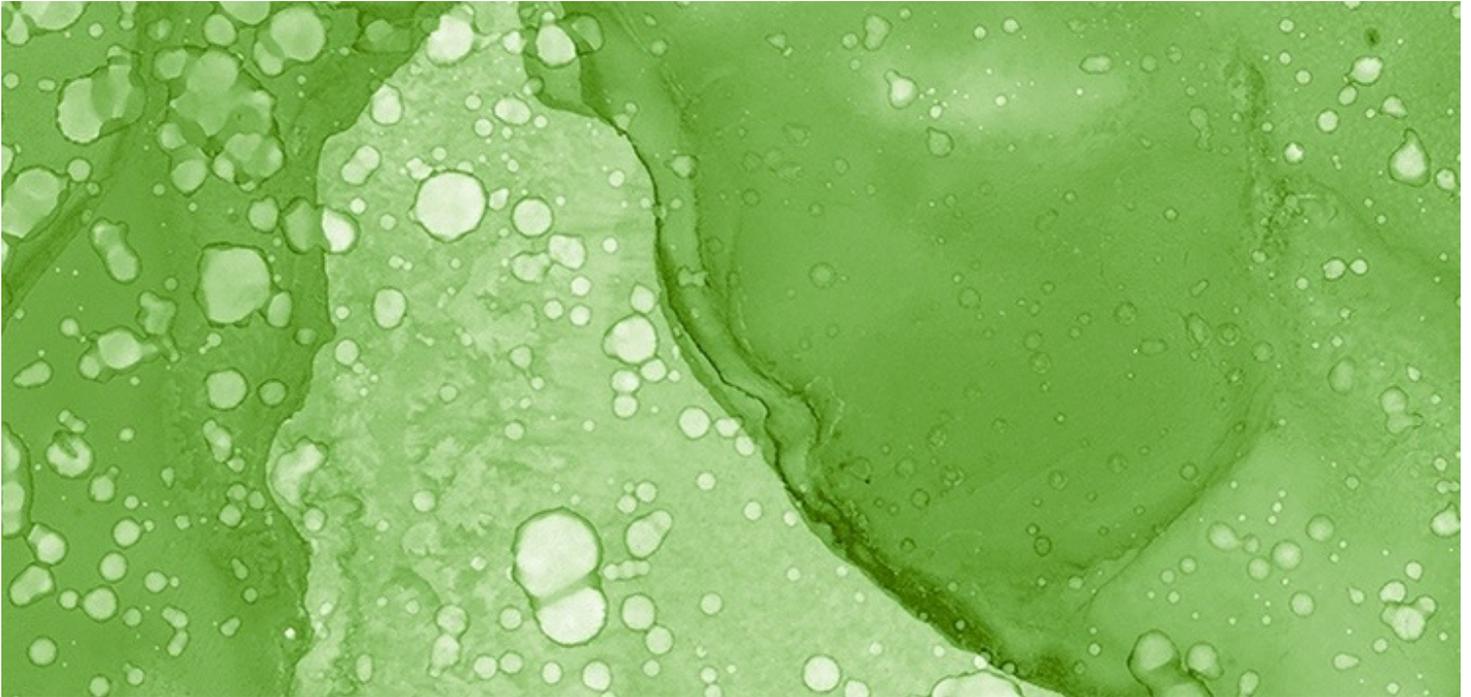
**Asian countries** are predominantly rice producers with Vietnam being one of the top five in the world. The extraction of silica from this renewable resource has been endeavored by many scientists and researchers.

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

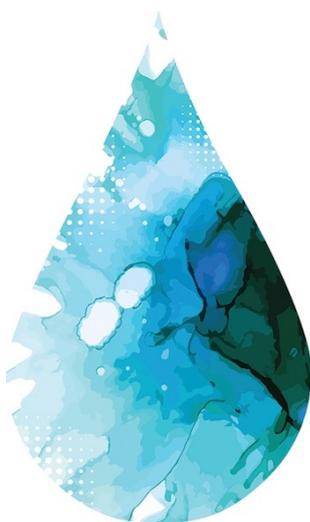
**Strategically** located along the waterways of the Mekong Delta in Vietnam, BSB has brought together the abundant access to rice husk, state-of-the-art technologies and skilled professionals to develop a cost effective nanoporous silica in its purest form.

**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.





## Paints & Coatings Applications



**Nanocoatings** provide cost-effective solutions to industries with demanding applications and performance requirements.

**Coating manufacturers** need to stay abreast with changing global trends such as the demands for multifunctionalities, waterborne, low VOCs and Bio-based coatings.

**The use of nanomaterials** results in performance enhancements in wear and corrosion resistant coatings and demonstrates significant enhancement in outdoor durability, and vastly improved hardness and flexibility compared to traditional coatings.

**Biosil** can also be used as a matting agent, anti-settling and anti-sagging filler for the manufacture of high-performance coatings.





# Nanocoatings vs Traditional Coatings



**Unlike traditional coatings**, nanocoatings can offer multiple functionalities in a single coating such as:

- Anti-microbial
- Antifouling
- Hydrophobicity
- Thermal insulation & flame retardancy
- Dirt and water repellence
- Stimuli response
- Corrosion resistance
- Weathering resistance
- Anti-graffiti & Self-cleaning

**Anti-viral** nanocoatings also represent an excellent and viable technology to destroy the viruses' surface structure and functionalized nanoparticles can affect the viruses due to chemical interactions between the molecules-functionalizers and moleculesreceptors at the virus surface.





# Bio-based Nanocoatings



**Being a rice husk based** Nanoporous Silica, Biosil can be used as a Bio-based nanomaterial to meet the increasing demand of the global Green Coating market and can be customised for the manufacturing of a large variety of nanocoatings.

**Nanosilica** is used to improve scratch and abrasion resistance, corrosion resistance, impact resistance, increase tensile strength, and superhydrophobic and easy-clean properties.





## Hydrophobic Nanocoatings

The wettability of a substrate's surface or its hydrophobicity in short is characterized by its contact angle from zero to 180 degrees. Adding hydrophobic coating to a surface induces water repellent properties and the water contact angle achieved is higher than 90 degrees. On hydrophobic coated surfaces, liquid tends to “ball up” into spherical droplets and this is due to the balance of adhesive & cohesive forces between the solid and liquid surface.

Hydrophobic coatings can be applied on a variety of substrates including glass, metals, polymers, ceramics, ship hulls, concrete and textiles. Each of these segments also feature different types of component applications e.g., windshield, car body and interior in automobiles. Coatings of hydrophobic nature are actively used in a plethora of industries such as Automotive, Aerospace, Building & Construction, Marine, Textiles, Medical, Electronics and so on for its many functions as listed below.

- **Anti-corrosion** – Prevents the interaction of corrosive and harmful materials on the applied surface through barrier and inhibition mechanism, reduces moisture uptake and migration of soluble salts responsible for inducing corrosion.
- **Anti-fouling** – Prevents accumulation of marine organisms on hull surface and provides improved drag resistance on water.
- **Anti-microbial** – Coated surface shows effectiveness in combating fungal and bacterial growth.
- **Self-cleaning** – Contaminant layer is not able to form over extended period on the coated substrate leading to reduction in maintenance costs. As the water droplet beads off, it takes away all the dirt, dust and contaminants along with it, thereby cleaning the coated surface.
- **Water repellent** – Fabrics coated with hydrophobic or superhydrophobic silica infused coatings demonstrate dry rapidly when compared to conventional fabrics.





## Superhydrophobic Nanocoatings

Superhydrophobic surfaces have a water contact angle of above 150 degrees and liquid droplets tend to bounce off its surface proving that it's highly water repellent and does not stain when liquid is poured over the coated surface. Superhydrophobic coatings are used in ultra-dry surface applications and has found a niche use in the maritime industry, electronics, medical, automotive and many more.

Superhydrophobic coatings can be applied on a variety of substrates including glass, metal, polymer, ceramics, concrete, rubber gloves (spray coated), textiles, outdoor electrical insulators and others. For example, “anti-microbial” gloves spray coated with a superhydrophobic coating can bring about the halt of pathogen transmission in the medical industry especially.

Superhydrophobic coatings functions can be summarised as below:

- **Anti-corrosion** – Superior corrosion resistance, reduced moisture uptake due to volumetric superhydrophobicity. Even if the coated surface gets abraded due to wear & tear, underlying layers maintain their superhydrophobic nature.
- **Anti-icing/wetting** – Provides excellent resistance against ice formation and superior water repellent properties on the substrate.
- **Anti-fouling** – Prevent growth of unwanted marine organisms on the hull of ships and helps increase the speed by reducing drag and fuel cost.
- **Anti-microbial** – Prevents accumulation or growth of fungi and bacteria on coated surfaces due to its moisture removal.
- **Self-cleaning** – Removes any debris or dirt from the coated surfaces which are exposed to harsh environmental conditions.





## Sustainability & Development



**Environmental sustainability** is also an important factor across most coatings markets and contributing to the commercial development of nanocoatings.

**There is a need** to replace petrochemical products and toxic heavy-metals in coatings with Bio-based coatings to increase sustainability.

**Favoured coatings** include waterborne coatings, highsolids, radcure coatings, powder coatings and nanoparticle coatings that allow for a reduction in carbon footprint and improve human health and safety.





We manufacture an extensive range of Bio Based Silica to suit your specific Paints & Coatings requirement.

Contact us for more information on TDS and MSDS of our bio-based silica to suit your substrate and application:

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ARE  
DRIVING YOU  
CHANGE  
OR ARE YOU  
BEING DRIVEN  
BY IT?

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