

Biosil®

Rice Husk Silica and Nano Silica
for the Rubber Industry
Multifunctional additives & Reinforcing fillers

Better products. Better prices. Better life.





About BSB Nanotech

Biosil represents a brand of Amorphous Silica derived from rice husk (RH) that is manufactured by BSB Nanotech. It is the world first commercially produced Rice Husk 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.

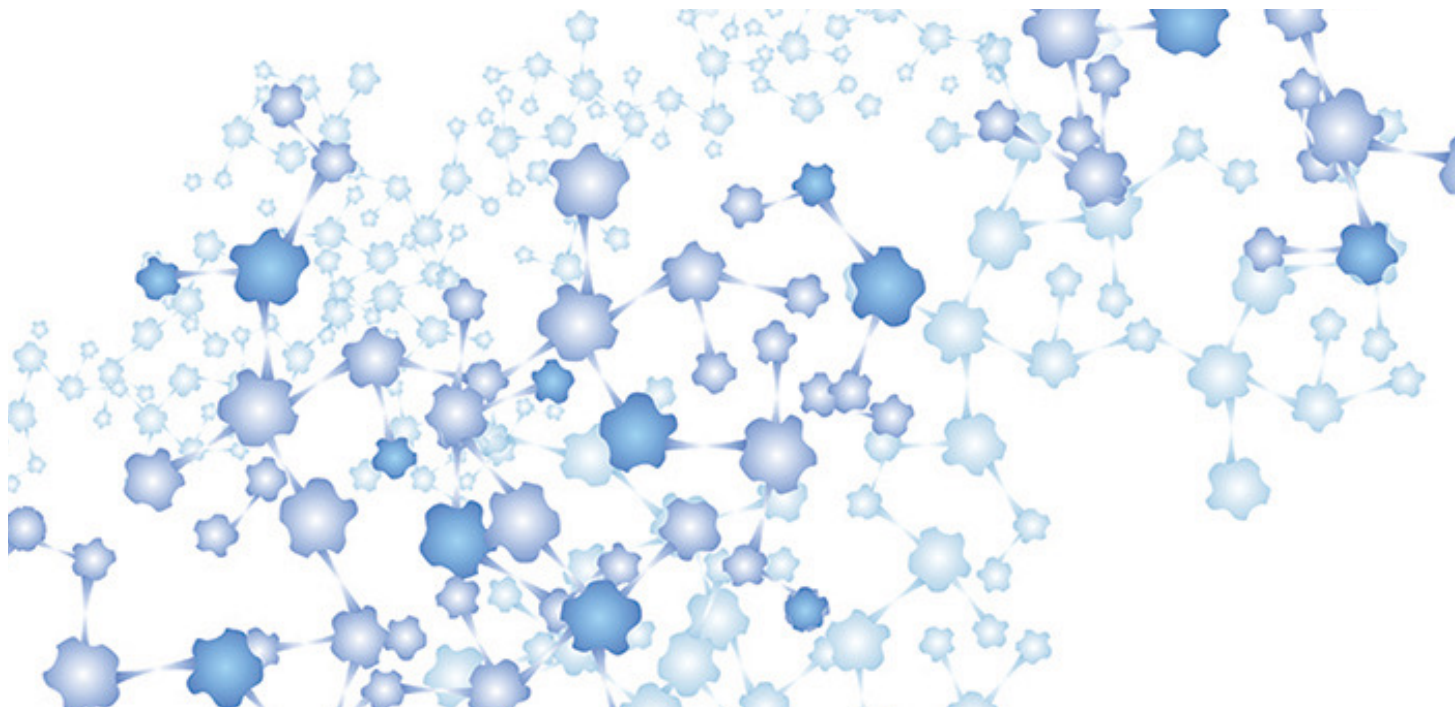
Key Milestones

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





Rice Husk Silica



Nanosilica or Silicon Dioxide nanoparticles (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.





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 Nanotech is the first company to successfully produce Rice Husk 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 ash and customised for various applications.





Reinforcing Fillers in Rubber Application

Silica has long been used as reinforcing fillers in the rubber industry especially in the production of automobile tires, conveyor belts, gloves, shoes, hoses, just to name a few.

Silica is shown to improve rheological properties and mechanical properties of rubber compound in many different aspects. The four main factors that influence effectiveness of fillers are namely particle size, particle surface area, particle shape and particle surface activity. Therefore, particles of Nano Silica have larger surface area due to their smaller size within the 1-100 nm range and it can be surface modified to further change its role in rubber as a filler.

The addition of Silica nanoparticles results in a homogenous mixture within the Natural Rubber matrix forming a stable filler-rubber composite. Nanosilica introduction in Natural Rubber improves its tensile strength, modulus and tear strength, abrasion resistance and hardness among many others. When used in polymer nanocomposite, Nanosilica migrates to surface at elevated temperatures and therefore providing better thermal ageing resistance to the rubber-filler composite.





BIOSIL vs Conventional Silica

Particle size is inversely related to surface area, and both are important factors that determine the effectiveness of a filler. Essentially the smaller the particle size, the higher the effective surface area that the particles can cover which in turn leads to better reinforcing capabilities within the rubber matrix. **Truly reinforcing fillers range from sizes of 10 nm to 100 nm** can significantly improve rubber properties.

Studies have shown that **surface area** of rice husk Nanosilica is found to be 252 m²/g, which is significantly better than conventional silica. However, this is not a fixed value as different methods in production can produce better surface area coverage by the silica nanoparticles. Higher purity of silica within the husk also results in better overall mechanical properties.

Biosil products are available in the range of **150 to 600 m²/g, a bigger and broader coverage** without compromising the strength and quality as well as providing with the highest purity percentage of silica. Besides hydrophilic silica, Biosil is also available in hydrophobic and superhydrophobic form, offering a new range of multifunctional properties for rubber applications.





Typical Applications & Benefits

Silicone Rubber Products

- Overall improvement in mechanical properties
- Prevents micro-agglomeration in SiO₂ particles

EPDM Rubber Products

- Increased modulus up to 135%
- Better tensile strength over conventional silica by up to 398%
- Enhanced dynamic mechanical thermal analysis

Tires

- Improves tensile strength, abrasion/tear resistance
- Improved processability and better hardness
- Better rolling resistance in the tires, which leads to efficient fuel consumption

Rubber gloves

- Produce superhydrophobic or “dry” gloves that repel any liquid droplets on its surface
- Antimicrobial gloves that can prevent pathogens from spreading

Footwear

- Improve wear and tear resistance in shoe soles
- Produce water-proof and slip-resistant shoe soles
- Provides superior durability, resilience and modulus

Industrial Rubber Products

- Enhanced heat build-up resistance, wear resistance and abrasion
- Increase in stiffness and reinforcing strength
- Increased tensile strength and modulus by over 300%



Biosil HLRU00.0299

Multifunctional Additives for Rubber

Biosil HLRU00.0299 is hydrophilic bio-based nano porous silica powder, synthesized from Rice Husk, used as Multifunctional Additives for Rubber.

Offers Multi-functional Benefits

- High reinforcing filler effect
- Increased stiffness and reinforcing strength
- Better tensile strength, tear & abrasion resistance
- Suitable for anti-settling agent formulation
- Good incorporation in different solutions
- Improved process-ability
- Enhanced resistance to heat build-up
- Extended product life in high-temperature environments.

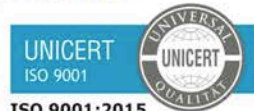
General Properties

PROPERTIES	UNIT	SPECIFICATION
State		Amorphous – Micron powder
Appearance		White
Loss on Drying (2h in 105 °C)	%	Max 8.0
Bulk density	g/cm ³	0.02 – 0.07

Specifications

PROPERTIES	UNIT	SPECIFICATION
Particle size (D50)	µm	3.0 – 10.0
Surface area	m ² /g	150 – 350

Product Information



QMS granted by Universal GmbH



Packaging

Biosil HLRU00.0299 is supplied in 09 kg paper bag.

Storage and Handling

- Store in dry place and handle sensibly to minimize dust generation.
- This product should be used within 12 months from production date.

Safety Data

Warning

- Product together with air may develop ignitable and explosive mixtures.
- Keep away from ignition source.
- Drying and abrasive properties may cause skin, eye or respiratory irritation.
- Avoid inhalation or prolonged contact with skin.
- If dusty conditions prevail, use gloves and adequate respirator.
- Dispose of in accordance with state and local requirement.
- See MSDS for more information.

First Aid

- Follow the rules of personal hygiene on dust inhalation and/or eye contact.

After eye contact

- Remove contact lens if have.
- Flush open eyes with large quantity running water for at least 15 minutes.
- Call for medical care if symptoms persist.

After skin contact

- Flush skin with water at least 15 minutes
- Call for medical care if symptoms persist.

After inhalation

- Supply fresh air
- Call for medical care if complaints
- Do CPR if stop breathing.

After swallowing

- Call for medical care
- Do not induce vomiting.



Biosil HLRU00.0399

Multifunctional Additives for Rubber

Biosil HLRU00.0399 is hydrophilic bio-based nano porous silica powder, synthesized from Rice Husk, used as Multifunctional Additives for Rubber.

Offers Multi-functional Benefits

- High reinforcing filler effect
- Increased stiffness and reinforcing strength
- Better tensile strength, tear & abrasion resistance
- Suitable for anti-settling agent formulation
- Good incorporation in different solutions
- Improved process-ability
- Enhanced resistance to heat build-up
- Extended product life in high-temperature environments.

General Properties

PROPERTIES	UNIT	SPECIFICATION
State		Amorphous – Micron powder
Appearance		White
Loss on Drying (2h in 105 °C)	%	Max 8.0
Bulk density	g/cm ³	0.12 – 0.18

Specifications

PROPERTIES	UNIT	SPECIFICATION
Particle size (D50)	µm	20.0 – 35.0
Surface area	m ² /g	150 – 350

Product Information



QMS granted by Universal GmbH



Packaging

Biosil HLRU00.0399 is supplied in 14 kg paper bag.

Storage and Handling

- Store in dry place and handle sensibly to minimize dust generation.
- This product should be used within 12 months from production date.

Safety Data

Warning

- Product together with air may develop ignitable and explosive mixtures.
- Keep away from ignition source.
- Drying and abrasive properties may cause skin, eye or respiratory irritation.
- Avoid inhalation or prolonged contact with skin.
- If dusty conditions prevail, use gloves and adequate respirator.
- Dispose of in accordance with state and local requirement.
- See MSDS for more information.

First Aid

- Follow the rules of personal hygiene on dust inhalation and/or eye contact.

After eye contact

- Remove contact lens if have.
- Flush open eyes with large quantity running water for at least 15 minutes.
- Call for medical care if symptoms persist.

After skin contact

- Flush skin with water at least 15 minutes
- Call for medical care if symptoms persist.

After inhalation

- Supply fresh air
- Call for medical care if complaints
- Do CPR if stop breathing.

After swallowing

- Call for medical care
- Do not induce vomiting.



Biosil[®] HO.RU00.0499

Multifunctional Additives for Rubber

Biosil HO.RU00.0499 is hydrophobic bio-based nano porous silica powder, synthesized from Rice Husk and treated with DDS, used as Multifunctional Additives for Rubber.

Offers Multi-functional Benefits

- Used as Rheology control, thickening, reinforcing additives.
- Better homogeneous distribution, improved processability of rubber/silica mixture, overall enhanced mechanical and other properties, surface appearance of final product.
- Suitable for application in outdoor insulators.
- Increase in electrical insulation & pollution withstands performance, extends the longevity of the insulators.
- Improve mechanical, other properties, shelf-life of product.

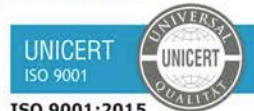
General Properties

PROPERTIES	UNIT	SPECIFICATION
State		Amorphous – Micron powder
Appearance		White
Loss on Drying (2h in 105 °C)	%	Max 8.0
Bulk density	g/cm ³	0.10 – 0.20

Specifications

PROPERTIES	UNIT	SPECIFICATION
Particle size (D50) (before surface modified)	µm	3.0 – 10.0
Surface area	m ² /g	100 – 300
Contact angle	degree	115 – 145

Product Information



QMS granted by Universal GmbH



Packaging

Biosil HO.RU00.0499 is supplied in 17 kg paper bag.

Storage and Handling

- Store in dry place and handle sensibly to minimize dust generation.
- This product should be used within 12 months from production date.

Safety Data

Warning

- Product together with air may develop ignitable and explosive mixtures.
- Keep away from ignition source.
- Drying and abrasive properties may cause skin, eye or respiratory irritation.
- Avoid inhalation or prolonged contact with skin.
- If dusty conditions prevail, use gloves and adequate respirator.
- Dispose of in accordance with state and local requirement.
- See MSDS for more information.

First Aid

- Follow the rules of personal hygiene on dust inhalation and/or eye contact.

After eye contact

- Remove contact lens if have.
- Flush open eyes with large quantity running water for at least 15 minutes.
- Call for medical care if symptoms persist.

After skin contact

- Flush skin with water at least 15 minutes
- Call for medical care if symptoms persist.

After inhalation

- Supply fresh air
- Call for medical care if complaints
- Do CPR if stop breathing.

After swallowing

- Call for medical care
- Do not induce vomiting.



ARE YOU
DRIVING
CHANGE

OR ARE YOU
BEING **DRIVEN**
BY IT

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