PÖRNER GRUPPE

BIO-SILICATE

THE ECO-FRIENDLY PÖRNER PROCESS

High-Purity Silicates derived from renewable Raw Material

Circular Economy: Turning Agricultural Residue into High-Value Industrial Products

Why Rice Plants?

- Rice is harvested in large volumes and widely available.
- Instead of being wasted, they can be converted into energy and valuable silica-rich ash.
- This turns a local low-value resource into high-value industrial products.

From Rice Hulls to Pure Silicate

Rice is a key food for humankind, with an annual harvest of nearly 800 million tons. During processing, about 20% remains as hulls, amounting to nearly 160 million tons.

These rice hulls are increasingly converted into sustainable energy in biomass power plants - leaving behind about one-fifth as ash. And this ash contains approx. 90% silica as SiO_2.

The Pörner Bio-Silicate Process uses this ash to produce sodium and/or potassium silicates for industrial applications, achieving a new level of purity, transparency, and colorlessness - with a CO_2 footprint reduced by up to 70%, compared to conventional high-temperature quartz sand processes.

Thus, Bio-Silicates represent a “green,” sustainable, and more economical solution.

Decarbonizing the Silicate Industry

A Sustainable Approach to Industrial Transformation

Triple Impact Solution

The technology addresses three global key challenges simultaneously:

- Demand for high-purity silicates
- Industrial decarbonization
- Circular Economy: Waste management of an agricultural residue

Key Advantages include:

- Production of high-quality silicates with lower impurities
- Valuable by-products such as carbon compound
- Significant energy reduction: needs only 1/3 of the energy compared to conventional methods
- Reduced CO_2 footprint (up to 70% in combination with biomass power plant, compared to conventional production from quartz sand)
- Integration of energy and material production in an integrated supply chain

Quartz Sand Silicate

Pörner Bio-Silicate

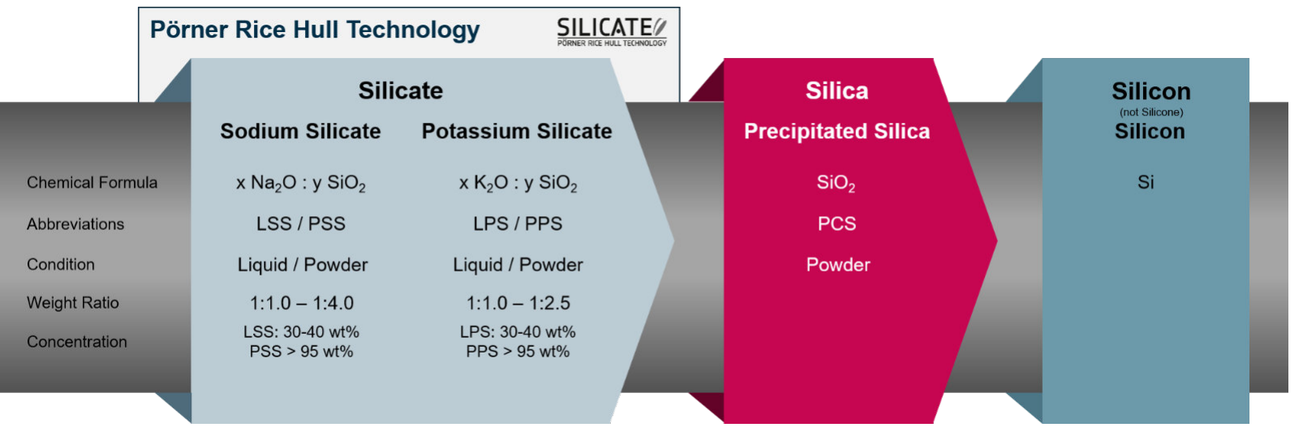
SUPERIOR PURITY AND CUSTOM RATIOS

Customizable material properties enabling broad application flexibility

The Bio-Silicate technology provides a versatile product range, precisely customized to meet the specific demands of the silicate consuming industries. Whether in liquid or powdered form, Bio-Silicates outperform conventional hydro-thermal and furnace processes in terms of purity and precise weight ratios.

By converting rice hull ash into high-quality sodium and potassium silicates, customers gain access to flexible product solutions. High-purity Bio-Silicates are the ideal raw material for the sustainable production of precipitated silica - the base material for the most demanding downstream applications.

The plant concept enables the production of high-quality sodium and potassium silicates using the same configuration.



Rice Hulls to High-Quality Silicate

Sodium Silicate: liquid or solid

Liquid Sodium Silicates (LSS) are widely applied as binders, stabilizers, and processing agents in industries with significantly higher SiO_2/Na_2O weight ratios of up to 4.0 (unlike the hydro-thermal process, which is limited to 2.6).

The content of traceable metals in the Liquid Sodium Silicate produced with the Pörner Bio-Silicate technology is up-to 8-10 times lower than conventional Liquid Sodium Silicate produced from quartz sand.

The Liquid Sodium Silicate can be further treated to Powder Sodium Silicate (PSS) with a dry content above 95wt%.

Potassium Silicate: liquid or solid

In modern agriculture, continuous nutrient supplementation is essential for sustainable yields. Liquid Potassium Silicate (LPS) provides a high-efficiency solution for precision soil and foliar fertilization.

The SiO_2/K_2O ratio ranges from 1.0 to 2.6, and the solids content is up to 37%. The Liquid Potassium Silicate can be further treated to Powdered Potassium Silicate (PPS) with a dry content above 95wt%.

PRODUCTS IN HIGH DEMAND WORLDWIDE

Serving Multiple High-Growth Sectors from a Single Platform

Key Application Areas of Silicates

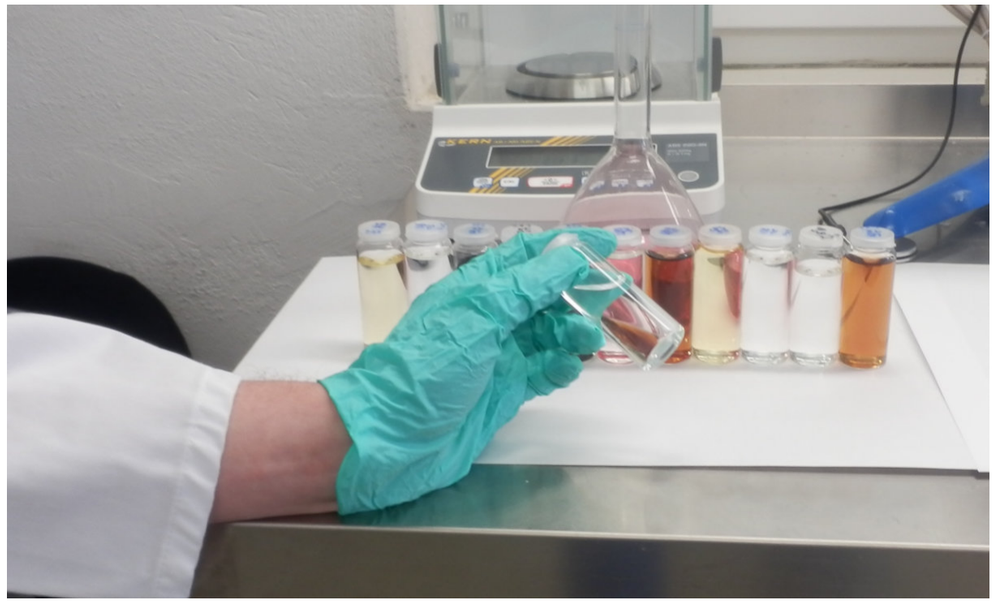
- **Coatings & Industrial Materials:** Paints, pigments, adhesives, corrosion protection, pulp & paper
- **Agriculture & Nutrition:** Fertilizers, soil stabilization, toothpaste
- **Consumer & Household:** Detergents, cosmetics, water treatment
- **Construction & Infrastructure:** Cement/concrete acceleration, refractory systems, geopolymer
- **Automotive, Specialty & Silica:** Tire manufacturing, drilling fluids, feedstock for precipitated silica production











Testings in the Pörner Research Center

The **Pörner Bio-Silicates** have been tested and are proven to be suitable in:

- Rubber tests in Green Tire
- Flow tests and anti-caking tests
- Whitening tooth paste
- Thickening tooth paste
- The powdered Bio-Silicates dissolve easily and without residue in warm water

A valuable by-product: Carbon Compound (CC)

During the processing of ash into silicates, **Carbon Compound / Cake** is obtained as a by-product during filtration and can be commercially utilized as a valuable material, such as:

- Filter aid, with a specific surface range of 200 - 600 m²/g
- Carbon adsorbent for adsorption of gaseous media streams (e.g. air purification)
- Soil improver in agriculture

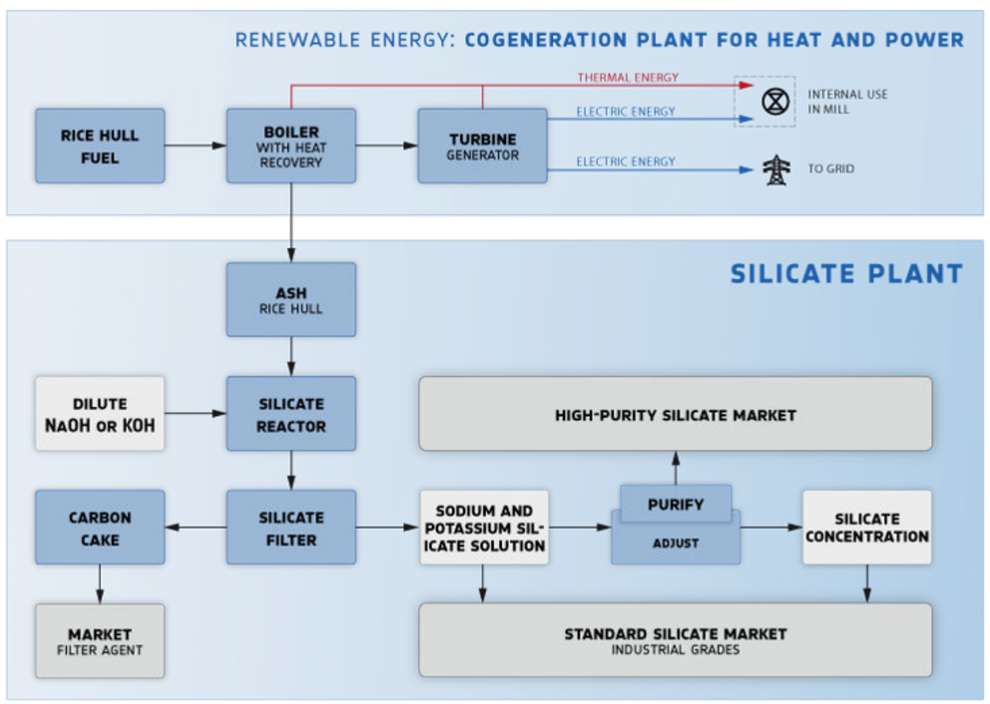
Carbon Compound

THE PÖRNER BIO-SILICATE PROCESS

A Smarter Route to High-Purity Silicates

The Pörner Bio-Silicate process converts rice hull ash into high-quality sodium and potassium silicates through an efficient, integrated pathway. Rice hulls from milling are fired in a biomass power plant to generate renewable energy and produce silica-rich ash, containing up to 90% amorphous SiO_2. This ash is then treated in the patented Pörner multi-stage process involving washing, alkaline digestion with sodium or potassium hydroxide, and solid-liquid separation.

The resulting silicate solution is purified, adjusted to the desired composition, and can be supplied either as a liquid product or further processed into high-purity powders. The process operates at a significantly lower temperature level than the alternative process, enabling reduced energy consumption, consistent product quality, and strong economic performance.



PROVEN SCALABILITY

Validated Product and Performance in Freiberg, Germany

Circular Thinking. Industrial Scale.

Bio-Silicate Research Center in Freiberg, Germany

The **Bio-Silicate Research Center** in Freiberg, Germany, tests raw materials from around the world. Its in-house laboratory analyzes the main results, evaluates them, and determines the chemical and physical parameters required for the design of the process plants.

Since 2017, production and evaluation tests have been conducted for leading industrial customers from 15 countries - and increasing. In principle, almost all ash derived from pure rice husks is suitable for the process.

STRATEGIC VALUE CREATION

Long-term value through a secure and cost-effective supply chain

Global demand in the consumer industries for products made from raw materials derived from sustainably sourced renewable resources is growing steadily.

Bio-Silicate is a highly cost-effective component of an alternative supply chain: the raw material will remain reliably and affordably available in the foreseeable future. Bio-Silicates are gaining traction as an economic and environmentally friendly alternative and can seamlessly replace conventionally produced silicates in existing plants without requiring modifications to plant infrastructure or formulations.

The quality of Pörner products has been confirmed in comprehensive tests conducted for leading global industrial users. Pörner uses proven components from world-leading manufacturers in its process plants to ensure high availability and durability.

All of this makes an investment in a Pörner Bio-Silicate plant a worthwhile investment that will pay for itself many times over for decades to come.

A Smarter Way to Produce Silicates - Economically & Ecologically

3D model of a Pörner Bio-Silicate plant

CONTACT US

Your next steps

Ready to Decarbonize Your Silicate Application? Send Us Your RHA Sample for Lab Testing!

Our Pörner experts support you from feasibility to full-scale plant implementation.

Your Contact Persons

Hamburgerstrasse 9
1050 Vienna, Austria
Phone: +43 5 05899-0
Fax: +43 5 05899-99
Email: vienna@poerner.at
www.poerner.at

Mario Sleska
BUSINESS DEVELOPMENT BIO-SILICATE
+43 5 05899-618
mario.sleska@poerner.at

Gerhard Bacher
GENERAL MANAGER PÖRNER GRIMMA
+49 3437 9854-0
silica@poerner.de

Pörner is an independent European engineering and contracting company for process plants, delivering full-scope engineering and project execution from a single source - with 550 employees across ten European locations.
Founded in Vienna, Austria in 1972, the Pörner Group has implemented more than 2,500 projects for leading customers across refining, petrochemicals, chemicals, pharmaceuticals, and energy & environmental processing.
Based on proprietary technologies such as Biturox® (global leader in bitumen plants), Bio-Silicates from rice hull ash, SynWax™ synthetic waxes, formalin technology and tailored water treatment, Pörner supports investors worldwide in innovative projects.

PÖRNER GRUPPE

© Pörner Ingenieurgesellschaft mbH 04 / 2026