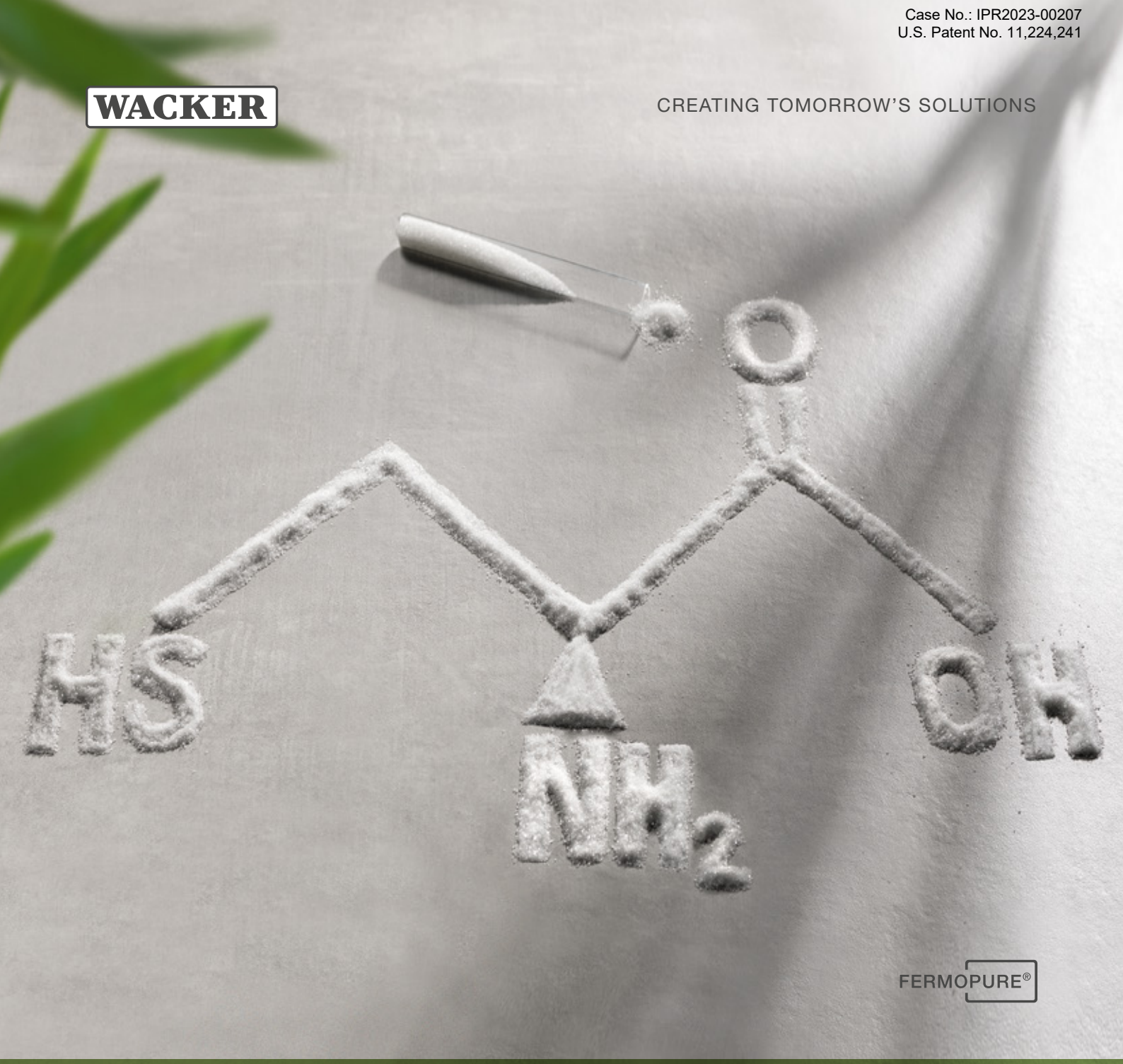
WACKER

CREATING TOMORROW'S SOLUTIONS



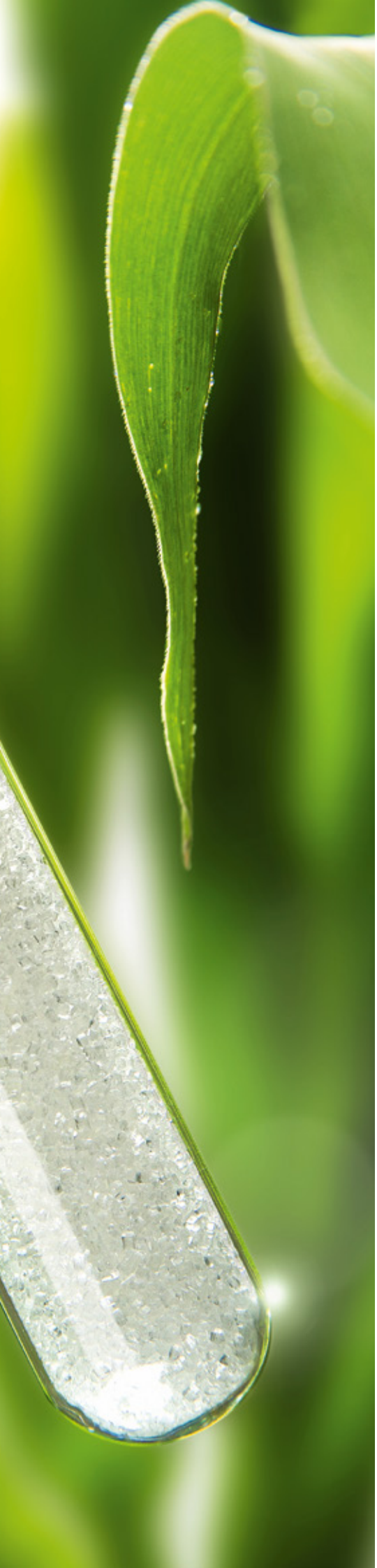
FERMOPURE®

FOOD I SUPPLEMENTS I PHARMA I COSMETICS

FERMOPURE® – PLANT-BASED L-CYSTINE AND L-CYSTEINE

TRUSTED EXPERTISE IN BIOTECH

WACKER is the first company in the world to produce plant-based L-cystine and L-cysteine in a sustainable fermentation process. This patented technique was awarded an environmental prize in 2008, because it uses 96% less hydrochloric acid than is required for the typical chemical extraction from hair and feathers. WACKER's natural L-cystine and vegan L-cysteine are manufactured with state-of-the-art equipment, resulting in the highest quality.



NEW FACILITIES AND A NEW BRAND

With the transfer to the facilities in León, Spain, our L-cystine is now produced in compliance with the outstanding quality demands of FSSC 22000, a GFSI-recognized standard for food safety management systems, and ISO 9001:2015. WACKER's new fermentation site in León has certificates for both standards to guarantee a superior safety level for our products. The products, marketed under the new FERMOPURE® brand, are highly versatile and offer benefits for multiple applications in the food and pharmaceutical industries.

Product Highlights

- No human or animal sources
- Utmost purity and safety
- Certified to FSSC 22000 and ISO 9001
- Vegan and vegetarian
- Kosher and halal-certified
- Sustainable raw materials
- Various grades for multiple applications

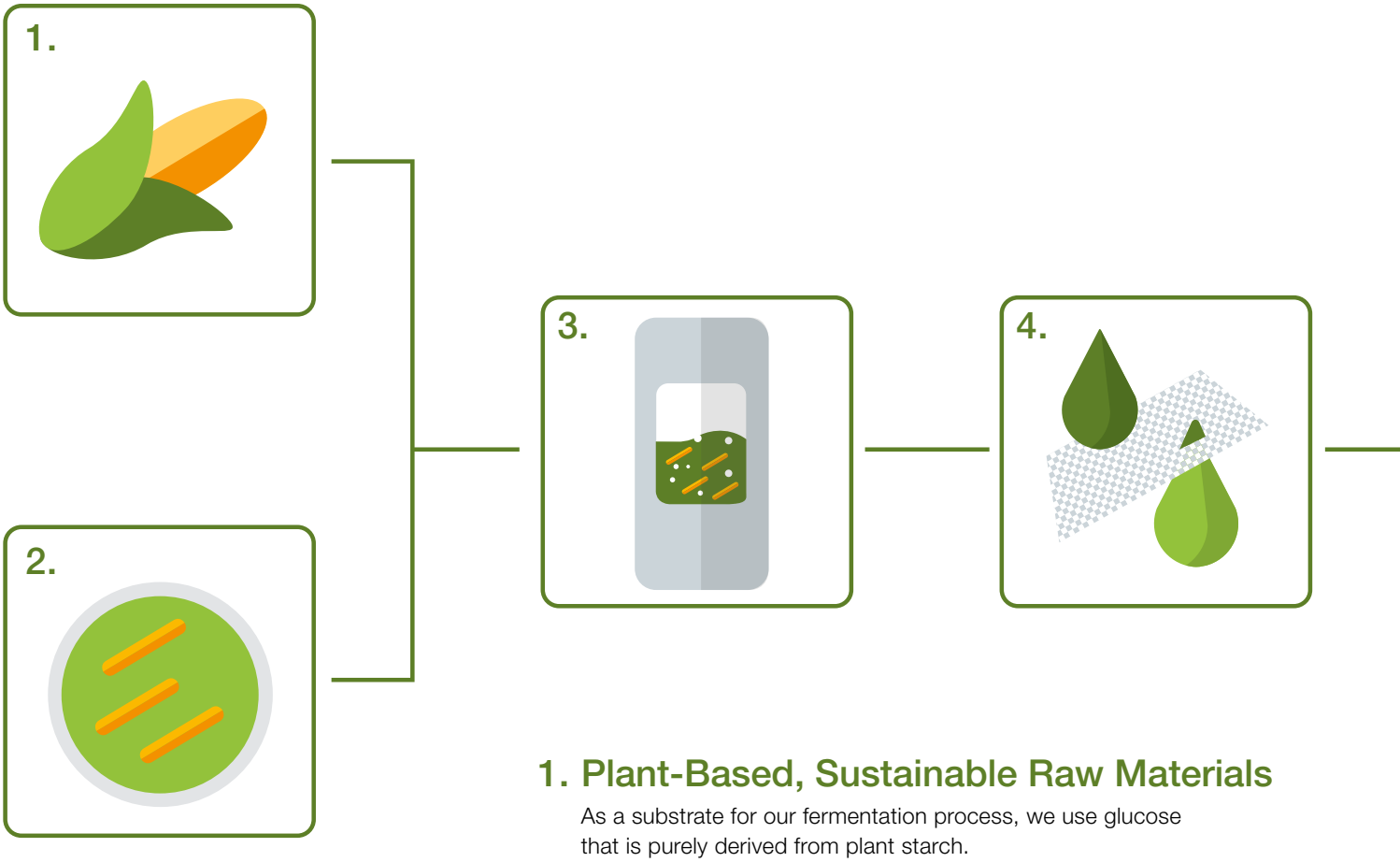
WACKER is a member of the „Together for Sustainability" initiative and is rated by EcoVadis.

TOGETHER FOR SUSTAINABILITY

GOLD 2018 ecovadis CSR Rating

FERMOPURE® is a registered trademark of Wacker Chemie AG.

FERMENTATION FOR UTMOST PURITY, SAFETY AND EFFICIENCY



1. Plant-Based, Sustainable Raw Materials

As a substrate for our fermentation process, we use glucose that is purely derived from plant starch.

2. Microorganisms

E. coli, one of the most well-characterized organisms, is by nature able to synthesize L-cysteine. We use a harmless strain, whose metabolism has been optimized for maximum efficiency. No antibiotics are required.

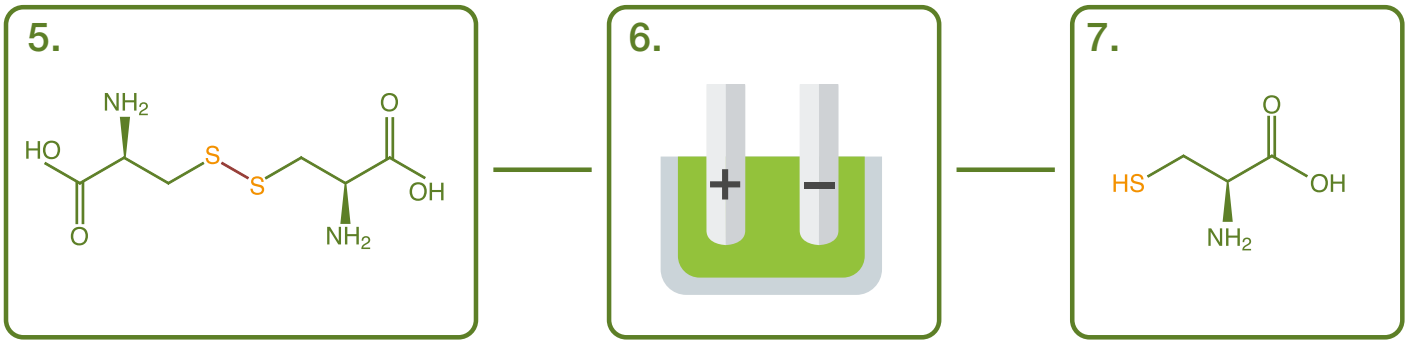
3. Fermentation

In the fermentation tank, the microorganisms produce L-cysteine from glucose and inorganic trace elements in a continuous stream. The product is released into the broth and directly forms the dimer L-cystine.

4. Purification

The fermentation broth is purified to yield natural L-cystine of the highest quality.

WACKER's patented biotechnology process does not use any animal products and greatly reduces the use of hydrochloric acid in comparison to alternative chemical extraction methods.



5. L-Cystine

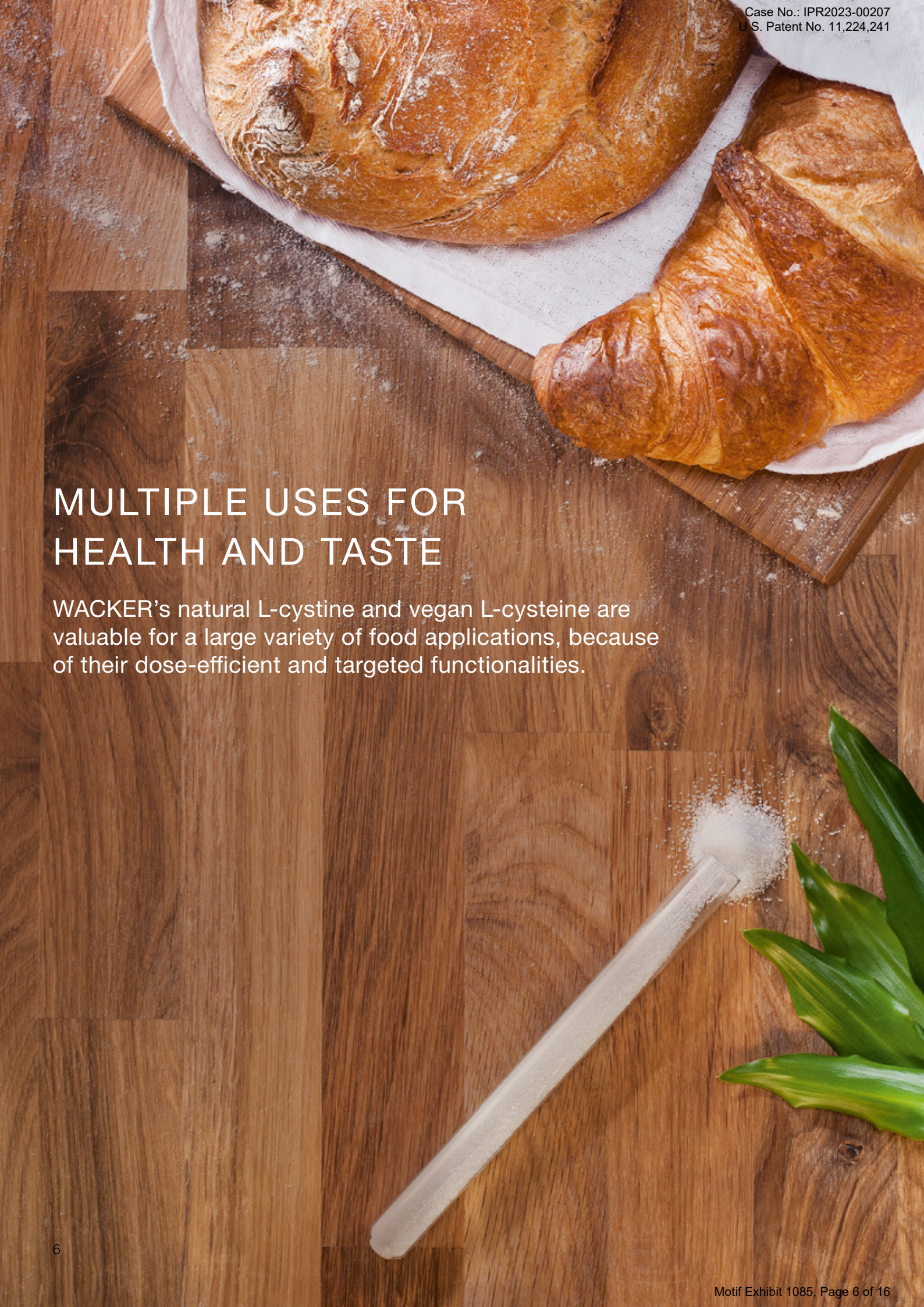
L-cystine is a dimer consisting of two oxidized L-cysteine molecules, linked by a disulfide bridge.

6. Electrolysis

One more step is required to produce L-cysteine. The dimer L-cystine is reduced by electrolysis to the monomeric L-cysteine.

7. L-Cysteine

L-cysteine is one of the 20 natural amino acids that are the building blocks of proteins. Because of its sulfhydryl side chain (-SH), which is unique among the amino acids, it is highly reactive and forms stable disulfide bridges.



MULTIPLE USES FOR HEALTH AND TASTE

WACKER's natural L-cystine and vegan L-cysteine are valuable for a large variety of food applications, because of their dose-efficient and targeted functionalities.

Flavor Production

Via Maillard reaction, L-cysteine can be used to create meaty and savory reaction flavors that are suitable for vegan and vegetarian applications.

Dough Softening

By reducing the dough's disulfide bonds, our vegan L-cysteine works as a highly efficient dough conditioner. The dough becomes softer and easier to handle, yielding high-quality baked goods.

Infant Nutrition

The amino acid L-cysteine is an essential component of infant formula. WACKER offers the highest levels of purity and safety for this application.

SAFETY AND PURITY FOR PHARMA AND BIOTECH APPLICATIONS

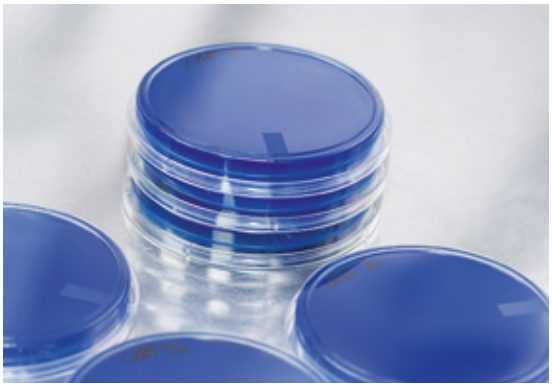
FERMOPURE® products offer utmost purity for the high standards of pharmaceuticals.

Bioactive Derivatives

L-cysteine is a starting material for the production of derivatives that are valuable medicines. Acetyl-cysteine, for example, liquefies mucous and thus serves as a therapeutic in cough sirups.

Protein Building Block

L-cysteine serves as a building block for protein and peptide actives in the pharmaceutical industry. It is also a component of amino-acid infusion solutions for parenteral nutrition.



Microbiology and Cell Cultures

L-cysteine and L-cystine are essential nutrients for agar plates and nutrient broths for cultivating bacteria, yeasts or cell cultures.

Protein Refolding

L-cysteine can be used as a processing auxiliary for recombinant protein bioactives. In this function, the amino acid aids e.g. in the production of human insulin or antibody fragments.

Medical Diagnostics

L-cysteine is a very popular target for site-directed labeling experiments to investigate biomolecular structures and dynamics.

FOR HEALTH AND BEAUTY

The amino acid L-cysteine is a fundamental building block of proteins in human cells. Apart from this, there are several targeted functionalities of L-cystine and L-cysteine in cosmeceuticals.

Antioxidant Power and Anti-Aging

The sulfhydryl group neutralizes free radicals and makes L-cysteine an effective antioxidant. In addition, L-cysteine is the active component of the cells' most important protecting agent: glutathione. Supplementation of L-cysteine can boost the synthesis of glutathione in the body and thereby might support healthy aging.

Hair and Nail Health

L-cysteine is an essential component of keratin, the main protein in hair, skin and nails. The amino acid supports the structure and strength of hair, skin and nails via disulfide bridges.

Beautiful Skin

L-cysteine inhibits tyrosinase and switches the melanogenesis pathway to pheomelanin production. This can induce skin lightening and supports the reduction of age and UV spots. L-cysteine can also improve moisturizing and help to prevent wrinkles.

Hair Treatment and Perms

By opening the hair's disulfide bridges, L-cysteine is able to initiate impressive texture transformations as the central component of modern straightening and curling treatments. At the same time, L-cysteine can protect the hair from damage and add shine. FERMOPURE® products are free from the pungent smell that is often created by alternative perming agents.

The information provided is addressed to an expert audience only and is available worldwide. It may contain statements that do not apply to your country. As claims do not refer to finished products, but solely to ingredients, they may not conform to Regulation (EC) No. 1924/2006. It is up to the marketer of any finished product to ensure that the finished product containing such ingredients and the claims associated therewith are lawful and are in compliance with all valid legislation and regulations of the country or countries where said product is to be sold.

PRODUCT OVERVIEW

Application	FERMOPURE® Product Recommendation	Information	CAS Number
Food	L-Cysteine Food L-Cysteine Food A L-Cystine Food L-Cysteine Food FB L-Cysteine Food 20	HCl H_2O HCl anhydrous Free base HCl H_2O 20 Mesh	7048-04-6 52-89-1 56-89-3 52-90-4 7048-04-6
Infant Nutrition	L-Cysteine Infant Food L-Cystine Infant Food	HCl H_2O	7048-04-6 56-89-3
Pet Food*	L-Cysteine Food L-Cystine Food	HCl H_2O	7048-04-6 56-89-3
Pharma	L-Cysteine Pharma L-Cysteine Pharma FREE BASE L-Cysteine Pharma ENDOTOX L-Cystine Pharma L-Cystine Pharma LOW SULFATE	HCl H_2O HCl H_2O endotoxin tested	7048-04-6 52-90-4 7048-04-6 56-89-3 56-89-3
Dietary Supplements	L-Cysteine Food L-Cystine Food	HCl H_2O	7048-04-6 56-89-3
Personal Care	All Pharma grades		

* Currently only available in the United States, but soon to come to other regions, too.

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For More Information

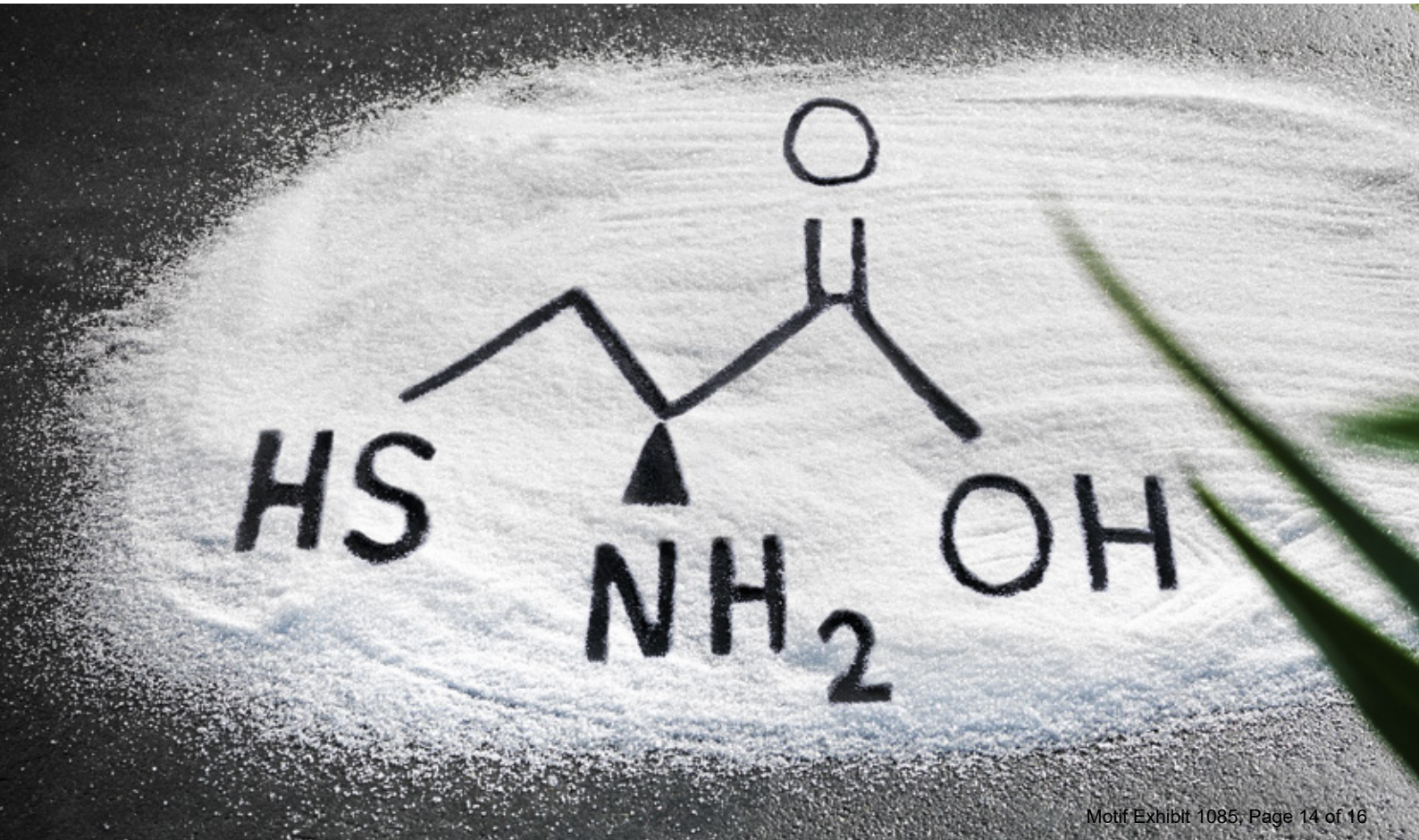
Please go to: **www.wacker.com/amino-acids** or feel free to contact us at **info.biosolutions@wacker.com.**
International toll-free number: 00 800-6279-0800

ABOUT WACKER BIOSOLUTIONS

In the 1980s, WACKER, a globally operating chemical company, took its first steps in the field of biotechnology to complement its established portfolio of chemical products. Today, WACKER BIOSOLUTIONS, the Group's biotech and life-science division, offers tailored and innovative solutions and products for the food, pharmaceutical and agrochemical industries based on advanced production processes.

We supply the food industry with raw materials and additives for improving products and processes. Our product range for the food industry includes fermentation-generated vegan L-cystine and bioengineered cyclodextrins – as well as highly powerful antioxidants. Another key specialty is the manufacturing of highly bioavailable complexes of lipophilic compounds such as curcumin or coenzyme Q10. We understand our customers' needs and offer not only food ingredients and dietary supplements, but also innovative solutions that respond to the food industry's current challenges. The following market segments are in focus: baked goods, savory flavors, beverages, dairy products, dietary supplements, chewing gums and confectionery.

WACKER operates 24 production sites around the world. Seven of them belong to the WACKER BIOSOLUTIONS network – from Eddyville in Iowa, USA, and Burghausen, Jena and Halle in Germany, to Nanjing in China. In 2018, the business division expanded its global value-creation network with two further production sites at León in Spain and Amsterdam in the Netherlands. At its technical competence centers, WACKER develops tailor-made products and applications for its customers. In order to find solutions for every market that meet local requirements, the technical-center network spans three continents – from Adrian in North America and Burghausen in Europe, to Singapore and Shanghai in Asia.
WACKER BIOSOLUTIONS currently employs around 700 people worldwide.



EXPERTISE AND SERVICE NETWORK ON FIVE CONTINENTS

Sales offices, production sites and technical competence centers around the world.

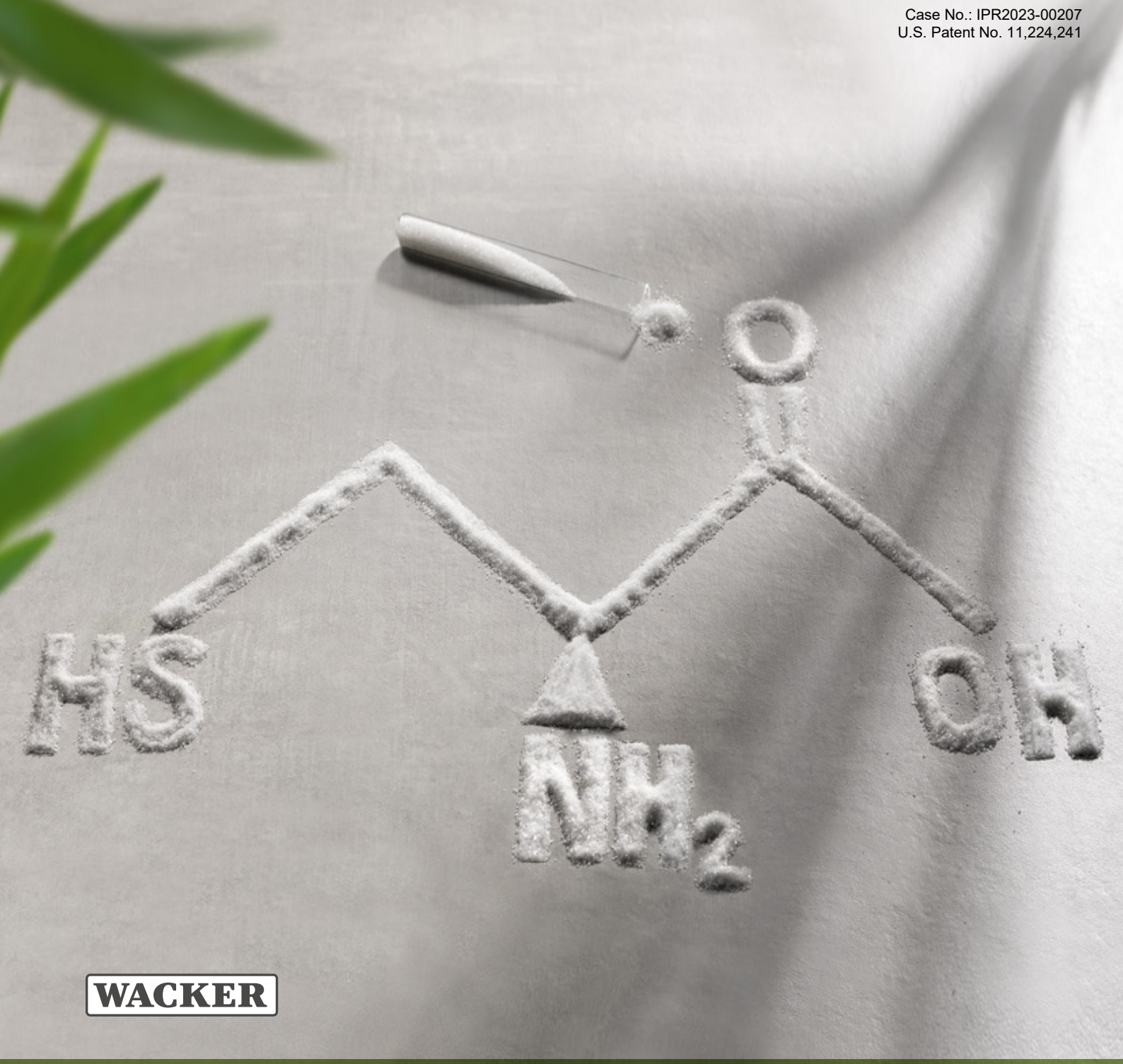
WACKER is one of the world's leading and most research-intensive chemical companies, with total sales of €6.21bn. Products range from silicones, binders and polymer additives for diverse industrial sectors to bioengineered pharmaceutical actives and hyperpure silicon for semiconductor and solar applications. As a technology leader focusing on sustainability, WACKER promotes products and ideas that offer a high value-added potential to ensure that current and future generations enjoy a better quality of life, based on energy efficiency and protection of the climate and environment.

Spanning the globe with 4 business divisions, we offer our customers highly-specialized products and comprehensive service via 26 production sites, 23 technical competence centers, 14 WACKER ACADEMY training centers and 52 sales offices in Europe, North and South America, and Asia – including a presence in China. With a workforce of some 14,400, we see ourselves as a reliable innovation partner that develops trailblazing solutions for, and in collaboration with, our customers. We also help them boost their own success. Our technical competence centers employ local specialists, who assist customers worldwide in the development of products tailored to regional demands, supporting them during every stage of their complex production processes, if required.

WACKER e-solutions are online services provided via our customer portal and as integrated process solutions. Our customers and business partners thus benefit from reliable service and comprehensive information to enable projects and orders to be handled fast, reliably and highly efficiently.

Visit us anywhere, anytime around the world at: **www.wacker.com**

All figures are based on fiscal 2021.



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