



WACKER

FINE CHEMICALS

WACKER FERMENTATION-GRADE
CYSTEINE

CREATING TOMORROW'S SOLUTIONS



DISCOVER A NEW SOURCE OF
BUSINESS: VEGETARIAN CYSTEINE



For decades there was no other choice than human or animal-derived cysteine. WACKER FINE CHEMICALS now offers a vegetarian alternative by fermentation.

For decades, cysteine has been obtained mainly from human hair and, to a lesser extent, from feathers, pigs' bristles and hooves. In Asia, mainly in China, hair sweepings are collected from hairdressers by professional gatherers who travel around the country.

Until now, a large part of the world's demand for cysteine has been met by boiling these substances with concentrated hydrochloric acid and activated carbon followed by electrolysis.

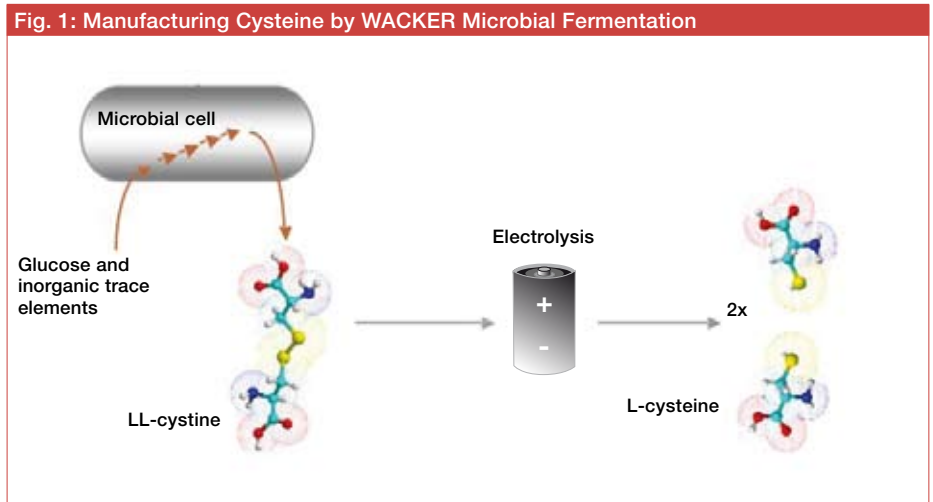
Unlike with most other amino acids, there was no available fermentation-based production method for cysteine. BSE and avian influenza have reinforced a continuing trend toward avoiding animal-based raw materials, and are fueling increased consumer interest in the origin of raw materials used. Consequently, WACKER now offers a range of fermentation-grade L-cystine/L-cysteine products. Starting from raw materials of vegetable origin and inorganic trace elements, the products are manufactured via microbial production.

BECAUSE YOU CAN'T LOSE BY PLAYING IT SAFE

The WACKER fermentation-grade L-cystine/L-cysteine products are manufactured via a patented production process which is basically depicted in Figure 1. The new approach does not necessitate introducing a foreign gene into Escherichia coli but consists, as in the conventional cultivation and selection of microorganisms, simply in optimizing genes already present in the bacterium. Instead of producing just enough cysteine to cover its own needs, the optimized E. coli strain also releases large quantities into the nutrient medium.

Broad Application Base

Cysteine is a versatile compound suitable for a wide range of applications in the food, pharma and cosmetics industries. Figure 2 lists several key applications as well as which cysteine products



are typically used or which might be suitable. Their antioxidant properties in particular allow the continuous development of new applications.

Fig. 2: Product Recommendations for Selected Applications

	Food			Pharma Raw Material	Cosmetics	
	Flavor Ingredient	Industrial Baking	Nutraceutical/ Nutrition		Hair Care	Skin Care
L-Cystine	•		•	•	•	
L-Cysteine Hydrochloride Monohydrate Food	•				•	
L-Cysteine Hydrochloride Monohydrate Food 20 Mesh	•	•				
L-Cysteine Hydrochloride Anhydrous Food	•	•	•			
L-Cysteine Hydrochloride Monohydrate Pharma				•		
L-Cysteine Free Base	•		•	•		
N-Acetyl-L-Cysteine			•			•



**For Soft and Fresh Bread –
Cysteine for Bakeries**

In bakery applications, cysteine's sulfhydryl groups break open the disulfide bonds of the protein gluten, a component of flour. As a result, the viscosity of the dough is reduced and it becomes softer and easier to work. An added advantage is that the volume of the formed dough increases during baking.

**For Improved Flavor –
Cysteine for the Food Industry**

Combined with various sugars, cysteine produces a seasoning with a pleasant meat flavor. Also, new innovative snacks and ready-made meals can be prepared for the vegetarian market.

**For Longer-Lasting Beauty –
Cysteine for the Cosmetic Industry**

Cysteine breaks open the disulfide bonds in keratin and is therefore used – especially in Asia – to prepare hair for “perms.” Thioglycolic acid, which is predominantly used in Europe for this purpose, has an unpleasant smell and also other disadvantages, such as allergic properties.

**Making Life Easier –
Cysteine for Other Industries**

Cysteine's properties as a free-radical scavenger, reducing agent and glutathione precursor make it an extremely versatile raw material for the fast-growth market of functional food supplements. Also, cysteine is in great demand in the traditional pharmaceutical field. N-acetyl cysteine breaks open the disulfide bonds in bronchial phlegm, which liquefies. The mucus is prevented from lodging in the

bronchial tubes and can be coughed up. Acetyl cysteine is thus a valuable agent in combating coughs and even mucoviscidosis. There is also a great demand for non-animal derived amino acids, as building blocks in pharmaceuticals.

IT'S YOUR CHOICE



WACKER offers a broad range of cystine/cysteine products designed to meet the needs of your particular application. Our products comply with the legislative requirements applicable to the food and pharma industries, and come in different particle sizes. Major ethnic food standards (like kosher and halal) are met and certified as well. Figure 3 provides an overview of available products.

Fig. 3: Product Overview

	Special Particle Size	Kosher	Halal	Package Size	Product Code
L-Cystine	-	•	•	25 kg	244101
L-Cysteine Hydrochloride Monohydrate Food	-	•	•	25 kg	60041286
L-Cysteine Hydrochloride Monohydrate Food 20 Mesh	• (20 Mesh)	•	•	25 kg	60041284
L-Cysteine Hydrochloride Anhydrous Food	• (100 Mesh)	•	•	25 kg	60041285
L-Cysteine Hydrochloride Monohydrate Pharma	-	•	•	25 kg	60030425
L-Cysteine Free Base	-	•	•	25 kg	60058083
N-Acetyl-L-Cysteine	-	-	-	50 kg	250944

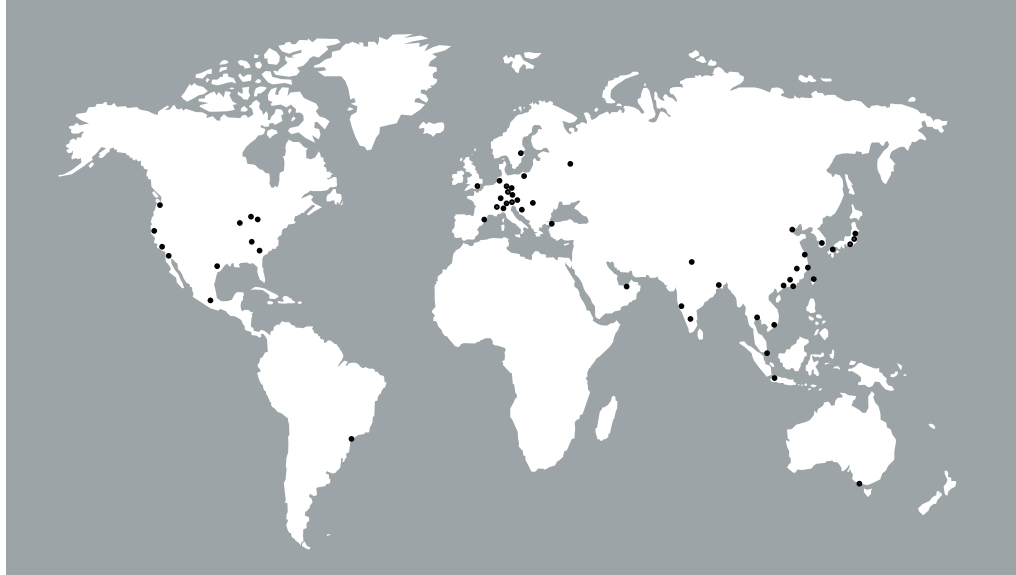
Now Is the Time to Add this Unique Ingredient to Your Portfolio!

WACKER cysteine offers a unique fermentation vegetarian grade that is not only a very reliable, safe and highest-purity source, but also made in accordance with high GMP standards. Compared to the conventional method, the WACKER technology has the advantage of much lower energy and raw material consumption, and less waste. The process thus sets new standards in terms of environmental compatibility. WACKER cysteine is not derived from raw materials of animal or human origin. The starting products are sugar, salt and trace elements, all of which are of vegetable or inorganic origin. These raw materials are available in unlimited quantities, which means that continuous industrial production and on-time deliveries are ensured in the future. Our technology is capable of fully meeting the growing demand for cysteine and of keeping pace with market developments.

Main Product Properties

- Non-human non-animal origin
- Vegetarian
- Kosher
- Halal
- Compliant with all major food and pharma standards (EP, EU Directive 2000/63/EC, USP, JP, FCC)
- TSE/BSE safe
- High GMP standards
- Highest purity

WACKER AT A GLANCE



WACKER is a technology leader in the chemical and semiconductor industries and a worldwide innovation partner to customers in many key global sectors. With around 14,700 employees, WACKER generated sales of €3.34 billion in 2006. Germany accounted for 20 % of sales, Europe (excluding Germany) for 28 %, the Americas for 20 % and Asia-Pacific, including the rest of the world, for 32 %. Headquartered in Munich, Germany, WACKER has some 20 production sites worldwide and a global network of over 100 sales offices. With R&D spending at 5 % of sales in 2006, WACKER is among the world's most research-intensive chemical companies.

WACKER SILICONES

is a leading supplier of complete silicone-based solutions that comprise products, services and conceptual approaches. As a provider of solutions, the business division helps customers press ahead with innovations, exploit global markets fully, and optimize business processes to reduce overall costs and boost productivity. Silicones are the basis for products offering highly diverse properties for virtually unlimited fields of application, ranging from the automotive, construction, chemical, electrical engineering and electronics industries, through pulp and paper, cosmetics, consumer care and textiles, to mechanical engineering and metal processing.

WACKER POLYMERS

is the global leader for high-quality binders and polymer additives. This business division's activities encompass construction chemicals and functional polymers for lacquers, surface coatings and other industrial applications, as well as basic chemicals, i. e. acetyls. Products such as dispersible polymer powders, dispersions, solid resins, powder binders and surface coating resins from WACKER POLYMERS are used in the construction, automotive, paper and adhesives industries, as well as by manufacturers of printing inks and industrial coatings.

WACKER FINE CHEMICALS

is an expert in organic synthesis, silane chemistry and biotechnology, providing tailored solutions for its customers in the life sciences and consumer care industries. The range of innovative products includes complex organic intermediates, organosilanes, chiral products, cyclodextrins and amino acids.

With its comprehensive expertise, WACKER FINE CHEMICALS is a preferred partner for highly challenging custom-manufacturing projects in the fields of chemistry and biotechnology.

WACKER POLYSILICON

has been producing hyperpure silicon for the semiconductor and photovoltaics industries for over 50 years. As one of the largest global manufacturers of polycrystalline silicon, WACKER POLYSILICON supplies leading wafer and solar-cell manufacturers.

Siltronic

is one of the world's leading producers of hyperpure silicon wafers, supplying many major chip manufacturers. Siltronic develops and produces wafers up to 300 mm in diameter at facilities in Europe, the USA, Asia and Japan. Silicon wafers form the basis of state-of-the-art micro and nanoelectronics used, for example, in computers, telecommunications, motor vehicles, medical technology, consumer electronics and control systems.

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The data presented in this brochure are in accordance with the present state of our knowledge, but do not absolve the user from carefully checking all supplies immediately upon receipt. We reserve the right to alter product constants within the scope of technical progress or new developments. The information given in this brochure should be checked by preliminary trials because of conditions during processing over which we have no control, especially where other companies' raw materials are also being used. The information provided by us does not absolve the user from the obligation of investigating the possibility of infringement of third parties' rights and, if necessary, clarifying the position. Recommendations for use do not constitute a warranty, either express or implied, of the fitness or suitability of the product for a particular purpose.

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Wacker Chemie AG
Tel. +49 89 6279-1575
Fax +49 89 6279-2475
info.finechemicals@wacker.com

www.wacker.com/cysteine