

Sodium Percarbonate

A Guide for High Performance Eco-Friendly Bleaching



1. Introduction

1.1. OCI – Company profile

Welcome to OCI.

We would like to extend our sincere appreciation to all who have continuously supported OCI.

Since being founded in 1959, as a leading company in the chemical industry, we have dedicated ourselves solely to the enhancement of the chemical industry.

Today, OCI has grown into a leader in the fields of basic chemical, fine chemical, and petrochemical, as well as coal chemical and material processing industry.

Based on our technology and outstanding personnel, we promise to build an affluent and environment-friendly society for all our customers.

OCI is one of the world's biggest leading sodium percarbonate producers, with a capacity of 180,000MT/year and plants in Korea (OCI Iksan Plant), China (Zhejiang OCI) and USA (OCI Chemical Corporation). OCI acquired a plant in Zhejiang, China from Shangyu Jiehua Chemical in 2006 and established OCI Chemical Corporation in the United States in 2001.

As the leading supplier of sodium percarbonate, OCI worldwide offers not only the full range of sodium percarbonate but also technical services through its global network.

1.2. Sodium percarbonate

(Synonyms: sodium carbonate peroxyhydrate, sodium carbonate peroxide, carbonic acid disodium salt compound with hydrogen peroxide. Abbrev.: SPC, PCS etc., CAS No. 15630-89-4) is an adduct of hydrogen peroxide and sodium carbonate (soda ash).

Based on the molecular formula, the pure substance sodium percarbonate contains 32.5% hydrogen peroxide and 67.5% sodium carbonate (based on weight). It decomposes to oxygen, water, and sodium carbonate.

Commercial sodium percarbonate product contains generally 13.0% active oxygen approximately, which is equivalent to 27.6% hydrogen peroxide solution.

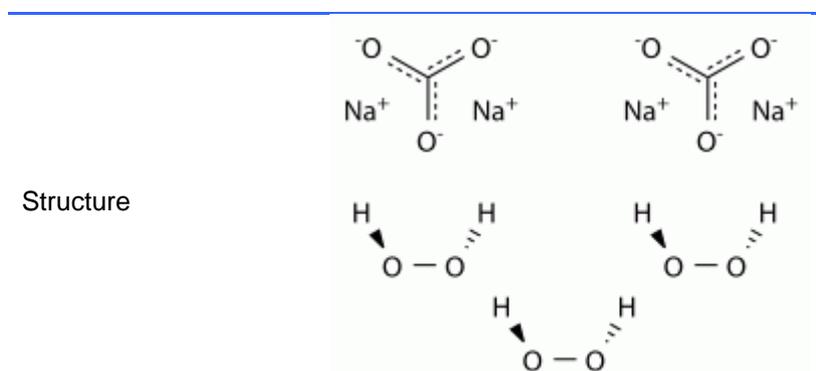
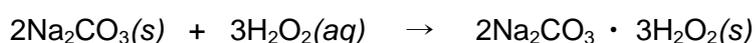
Sodium percarbonate is usually manufactured in the form of granule or powder – white, odorless and free-flowing granule or powder. This granule or powder product provides a stable source of alkaline hydrogen peroxide which is an environment-friendly bleaching agent being effective and stable at normal temperature.

2. Chemistry

2.1. Chemical and Physical properties of Sodium percarbonate

Sodium percarbonate was firstly mentioned by Tantat in 1899, and classified as a hydrogen peroxide supplement compound by Riesenfeld and Reinhold in 1909.

Sodium percarbonate (sodium carbonate peroxyhydrate) is an additional compound of sodium carbonate and hydrogen peroxide. So it is characterized as a hydrogen peroxide addition compound. In the manufacturing process of sodium percarbonate, hydrogen peroxide is used instead of water to form the crystal structure in the carbonate lattice.



Chemical name	Sodium carbonate peroxyhydrate
Empirical formula	$2\text{Na}_2\text{CO}_3 \cdot 3\text{H}_2\text{O}_2$
Molecular mass	314
Appearance	White granule
Odor	Odorless
PH (1% solution)	10.4 ~ 10.6
Decomposition Temperature (°C)	Over 50
CAS No.	15630-89-4
EINECS No.	239-707-6
EPA No.	68660-8
Other name	Sodium percarbonate Sodium carbonate peroxide

Sodium carbonate monohydrate



Sodium carbonate decahydrate



2. Chemistry

2.2. Decomposition mechanism of sodium percarbonate

When sodium percarbonate dissolves into water, it decomposes into sodium carbonate and hydrogen peroxide; those finally generate active oxygen having bleaching ability and deodorizing capability, and provide an alkali source.

– Sodium carbonate decomposed from sodium percarbonate is able to increase pH value in washing water to knock down the hardness activities of calcium ion and magnesium ion.

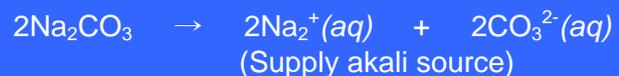
Also under alkaline washing conditions the surfaces of soil or contaminant particles and the substrates (e.g. fabrics, tableware or hard surfaces) to which they adhere,

acquire negative electrostatic charges and repel each other, loosening the soil or contaminant into the liquid and inhibiting re-deposition.

Decomposition of sodium percarbonate generates only harmless chemicals - sodium carbonate, oxygen and water but emits heat together, and it produces approximately 400 times its own volume in gases (oxygen and steam from water) if the sodium percarbonate product is not handled or stored properly.

The decomposition mechanism in water is described below.

- Decomposition of sodium percarbonate in water



3. Applications

Sodium percarbonate products have a wide range of applications in the field of cleaning products; the main user of sodium percarbonate is the household cleaning products industry, which is expected to use more than 95% of the worldwide total sodium percarbonate demand.

Sodium percarbonate has many functional benefits as liquid hydrogen peroxide has. Sodium percarbonate releases oxygen and alkali, which provide powerful cleaning, bleaching, disinfecting, and deodorizing capabilities.

Hence, it can suitably be used in several different kinds of products as follows.

- **Home laundry bleach**
 - Premium grade
 - Economy grade
 - Concentrated grade
- **Institutional cleaning products**
- **Heavy-duty detergent with bleach function**
- **Automatic dishwasher detergent**
- **Carpet cleaning booster**
- **Paint cleaner**
- **Concrete cleaner**

Other applications of sodium percarbonate products have been explored in many fields as follows.

- **Soil remediation**
- **Sanitizing & disinfecting products - Household & industrial**
- **Pulp & paper bleaching**
- **Denture cleaning products**

4. Products & Quality

4.1. Products produced by OCI technologies

OCI Iksan plant has started the first start-up to produce hydrogen peroxide at April 1979. And for using hydrogen peroxide downstream products, OCI Iksan plant has started the process producing sodium percarbonate from 1984 recognizing its potential growths. And now, OCI and its affiliates have become one of the world's biggest sodium percarbonate producers.

OCI has been accumulating advanced knowledge (many patents issued in Korea, USA, Germany, etc. for processing, dissolution rate, coating, stabilizers, stabilizing, etc.) on sodium percarbonate for over 30 years. Also as one of the biggest manufacturers of hydrogen peroxide and sodium carbonate – produced by Iksan plant and OCI Chemical at Wyoming, USA – OCI possesses advanced technical knowledge on the substances. (OCI produces all significant ingredients of sodium percarbonate by itself.)

Since developing sodium percarbonate using its own technology in 1984, OCI has continuously dedicated itself to research and development. As a result, it became possible to control most properties of sodium percarbonate – e.g., A. O content, particle size, dissolution rate, stability, and bulk density – and respond to the needs and wishes of our valuable customers.



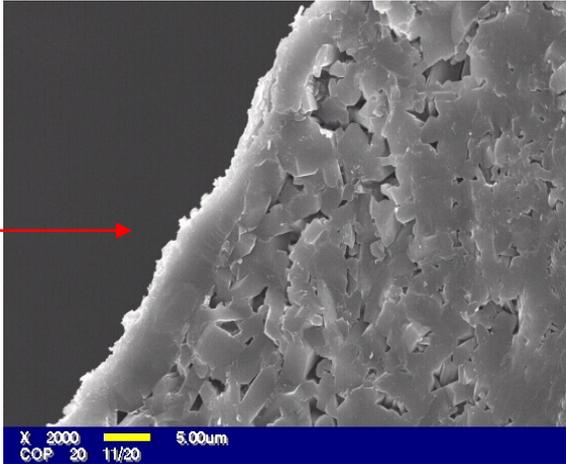
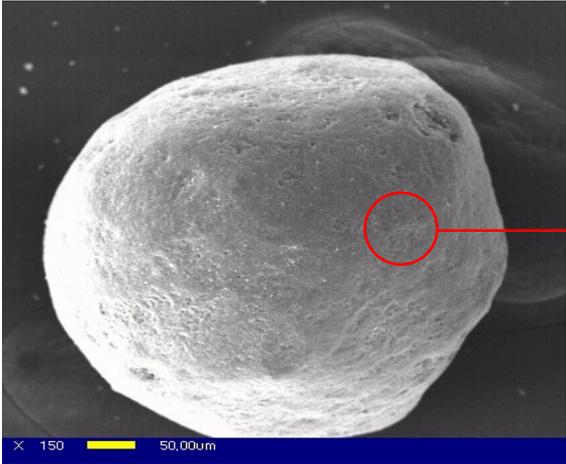
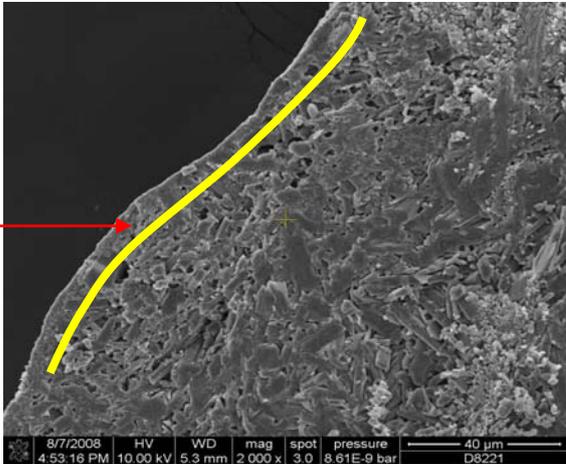
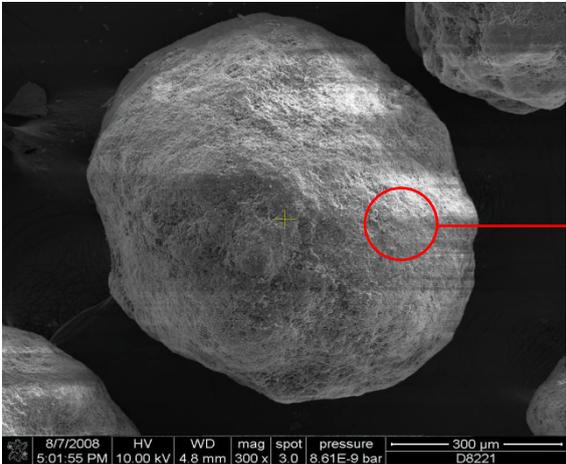
4. Products & Quality

4.2. Coating technology & Advantages of OCI products

All of the products manufactured in OCI Iksan plant are produced using advanced facilities and technologies. They enhance products' stability during storage and transportation, and compatibility with other ingredients of powder detergents.

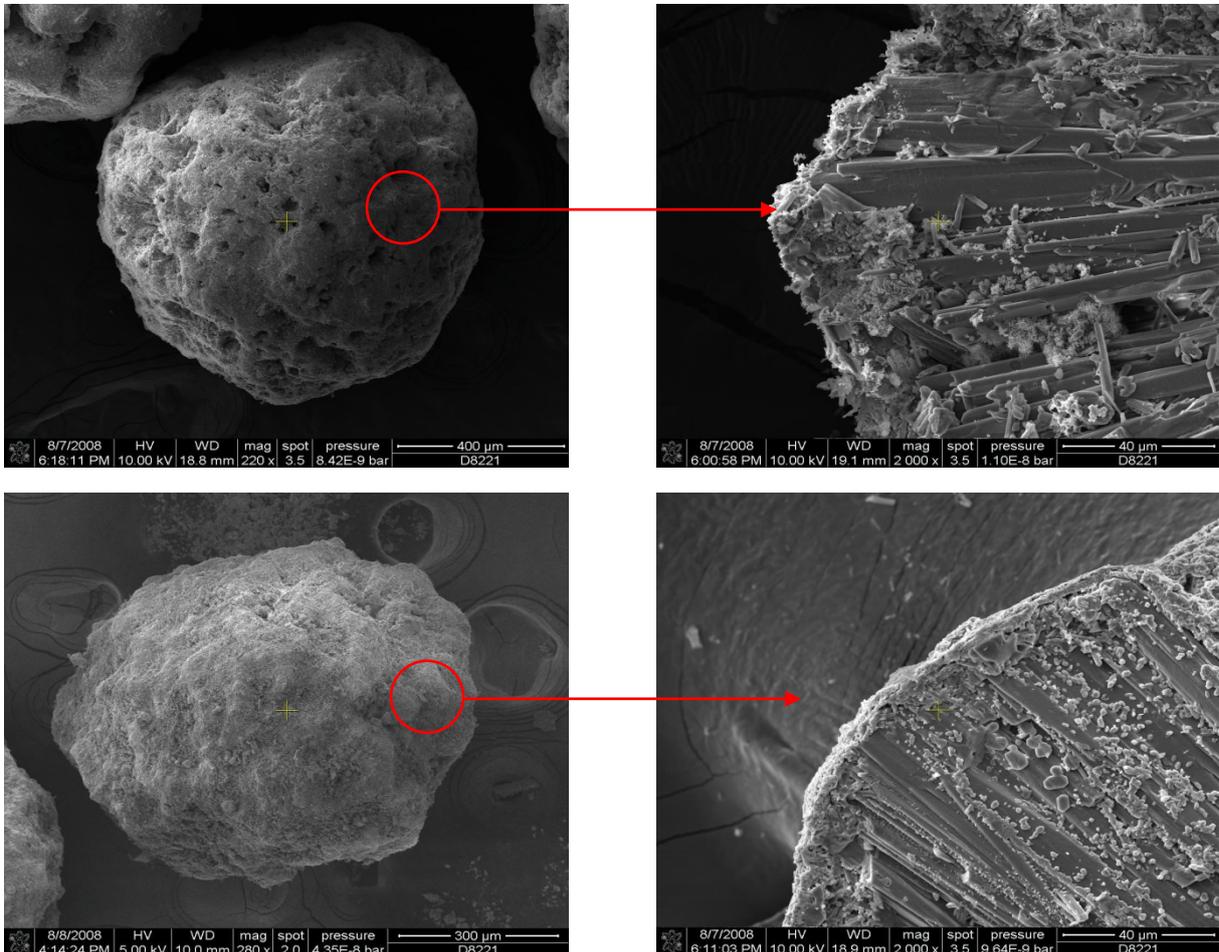
While competitors' sodium percarbonate products tend to be crystalline in appearance, all OCI's products consistently demonstrate spherical shapes, resulting in less attrition during processing and shipping. Furthermore, OCI Iksan plant does not allow the use of a pneumatic conveying system to prevent even a tiny damage to the spherical shape.

- Coated sodium percarbonate granules by OCI Iksan plant



4. Products & Quality

- Coated sodium percarbonate granules by competitors



As the SEM (Scanning Electron Microscope) pictures of sodium percarbonate products show, OCI products' granules exhibit consistencies in shape and size, resulting in less attrition and breakage. They facilitate processing and packaging and contribute to better product stability over time.

As stated above, OCI uses state-of-the-art technologies in producing sodium percarbonate products. The advantages of products thus produced are as follows.

- Advantages of sodium percarbonate products of OCI

- Better stability (longer shelf-life, storage, transportation)
- Better free-flowing properties
- Better compatibility
- Low attrition
- Low dusting
- High physical strength

4. Products & Quality

4.3. OCI Sodium percarbonate product list

In order to improve both the overall performance of dry detergents and stability under high temperature and humidity, OCI develops two powerful groups of sodium percarbonate products as below.

Furthermore, OCI developed technologies to control most properties of sodium percarbonate products to satisfy customers.

WPC (Sodium percarbonate, uncoated)	Standard sodium percarbonate (hereafter WPC) is a standard product. It is an oxygen-based bleaching agent designed specifically for use at home and industries.
---	---

WPC 120	A.O 12.0%, uncoated, better dissolution, low bulk density
WPC 130	A.O 13.0%, uncoated, standard product
WPC 130E	A.O 13.0%, uncoated, eco-friendly, phosphate-free
WPC 135	A.O 13.5%, uncoated, high A.O content

COP (Sodium percarbonate, coated)	Coated sodium percarbonate (hereafter COP) provides an enhanced stability for longer shelf life under high temperature and humidity and improved compatibility with additives of powder detergents.
---	---

COP 120	A.O 12.0%, coated, better dissolution, low bulk density
COP 125	A.O 12.5%, thick-coated, ADWD grade
COP 130	A.O 13.0%, coated, standard product
COP 130E	A.O 13.0%, coated, eco-friendly, phosphate-free



OCI Company Ltd.
Peroxide Business Team
OCI Building, 50 Sogong-dong
Jung-gu, Seoul, 100-718, Korea
Telephone : 82-2-727-9467
E-mail : pb@oci.co.kr
URL : <http://www.oci.co.kr>

WPC

(Sodium percarbonate, Uncoated)

CAS NO 15630-89-4

Introduction

WPC (uncoated, sodium percarbonate product) is a standard product. It is an oxygen-based bleaching agent designed specifically for use at home and industries.

Specifications

Category / Grades	120	130	130E	135
Appearance	White granular solid			
Available oxygen (wt.%)	>12.0	>13.0	>13.0	>13.5
Moisture content (wt.%)	< 1.0	< 1.0	< 1.0	< 1.0
Bulk density (Kg/L)	< 0.90	0.95 ~1.08	0.95 ~1.08	0.95 ~1.08
pH (1%, 20°C)	10.0 ~11.0	10.0 ~11.0	10.0 ~11.0	10.0 ~11.0
PSD(μ m, D50)	> 500	> 500	> 500	> 500

WPC 120

A.O 12.0%, uncoated, better dissolution, low bulk density

WPC 130

A.O 13.0%, uncoated, standard product

WPC 130E

A.O 13.0%, uncoated, eco-friendly, phosphate-free

WPC 135

A.O 13.5%, uncoated, high A.O content

Packaging units

25kg packet (paper bag with inner polyethylene film)

1000kg bulk bag (polypropylene bag with inner polyethylene film)



OCI Company Ltd.
Peroxide Business Team
OCI Building, 50 Sogong-dong
Jung-gu, Seoul, 100-718, Korea
Telephone : 82-2-727-9467
E-mail : pb@oci.co.kr
URL : <http://www.oci.co.kr>

COP

(Sodium percarbonate, Coated)

CAS NO 15630-89-4

Introduction

COP (coated, sodium percarbonate products) provides enhanced stability for longer shelf life under high temperature and humidity and improved compatibility with additives of powder detergents.

Specifications

Category / Grades	120	125	130	130E
Appearance	White granular solid			
Available oxygen (wt.%)	> 12.0	> 12.5	> 13.0	> 13.0
Moisture content (wt.%)	< 1.0	< 1.0	< 1.0	< 1.0
Bulk density (Kg/L)	< 0.95	0.95 ~1.20	0.95 ~1.20	0.95 ~1.20
pH (1%, 20℃)	10.0 ~11.0	10.0 ~11.0	10.0 ~11.0	10.0 ~11.0
PSD(μm , D50)	> 500	> 500	> 500	> 500

COP 120	A.O 12.0%, coated, better dissolution, low bulk density
COP 125	A.O 12.5%, thick-coated, ADWD grade
COP 130	A.O 13.0%, coated, standard product
COP 130E	A.O 13.0%, coated, eco-friendly, phosphate-free

Packaging units

25kg packet (paper bag with inner polyethylene film)
1000kg bulk bag (polypropylene bag with inner polyethylene film)

5. Safety, Storage & Handling

5.1. Safety concerns

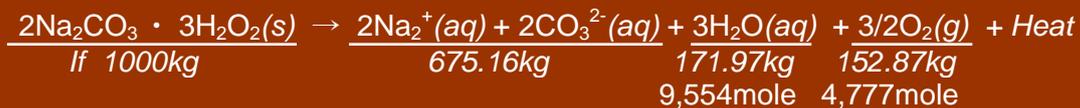
OCI is most concerned about the HSE (Health, Safety and Environment) of its employees and its valuable customers. It resulted in OCI being awarded a prize for **“15 Consecutive Accident-Free Period - No Accident for 3,600 days”** by a national entity called **“KOREA OCCUPATIONAL SAFETY & HEALTH AGENCY”** in 2008.

OCI products are very stable and easy to handle under normal conditions. For product handling and storage, we recommend a temperature of under 40 °C and relative humidity of less than 70%.

When sodium percarbonate decomposes due to certain conditions as high temperature, water, metals, organic substances, or acids, or the reaction of these elements, it generates only harmless chemicals - sodium carbonate, oxygen and water. However, in the process, it also emits heat that is approximately 400 times its own volume in gases (oxygen and steam from water) as described in the below formula.

The decomposition reaction can be very rapid and self-accelerating and can result in explosion by a rapid exothermic reaction if the sodium percarbonate product is not handled or stored properly.

- Decomposition of sodium percarbonate



the volume of gas will be 438,328 L at 100 °C

OCI is using several advanced technologies in order to minimize the risk of undesired decomposition and to delay the natural decomposition of sodium percarbonate products: coating technology – coating out-layer of sodium percarbonate granule; stabilizing technology – adding inorganic and organic chemical stabilizers; and control process – controlling moisture during production.

5. Safety, Storage & Handling

5.2. Storage

- Store in a dry, clean place
- Store under 40°C and a relative humidity of less than 70%.
- Protect from external heat sources such as sunlight
- Protect from water or moisture
- Keep away from combustible materials
- Keep away from catalytic materials
 - Water
 - Metals or rusts
 - Organic substances
- Avoid stacking bulk bags
- Keep a certain distance between bulk bags for air circulation
- Follow FIFO rule “First In, First Out”

5.3. Material of construction

- AISI 316L or AISI 304L (STS 316L, or STS 304L) for silo or pipes
- PTFE, PVDF, FEP for gasket accessories
- PP for filters
- PP or PE for packaging
- Strengthened PTFE or strengthened PVDF for hoses

5.4. Transportation

- Transport in clean and dry containers
- Protect from water or moisture
- Don't transport together with combustible materials
- Keep a certain distance between packages and/or containers for air circulation
- Avoid heat sources
- If wooden pallets are used, use only dried ones
- If pneumatic unloading system is used, the pressure should not exceed 1.8bar
- Avoid contact with contaminants such as oil, grease, etc.
- Wear safety glasses, gloves, and clothes during loading and unloading

5.5. Handling

- Maintain adequate ventilation in work area
- When handling products, use suitable personal protective equipment such as safety glasses, rubber gloves, and a dust mask
- Packages should be sealed to avoid penetration of moisture or contaminants
- In case of eye or skin contact, wash immediately with plenty of water for at least 15 minutes. Seek medical attention without delay
- Do not ingest or inhale the products. Drink large amount of water if the products are ingested, and seek medical attention without delay

6. Sales, Customer & Technical Supports

6.1. Sales, Customer service & Technical support representatives

As a global leading chemical company, OCI markets and distributes products all over the world and have networks in more than 50 locations worldwide.

OCI offers more than quality products. Our dedicated sales, customer service, and technical support staff are stationed around the globe to provide you with prompt, knowledgeable, and effective assistance to meet all your needs.

Sales, customer services, and technical supports are central to all functions of OCI. Our sales, customer service, and technical support representatives are all experienced professionals prepared to respond to our valuable customers whenever they experience problems with OCI products.

You can contact OCI representatives anytime.

6.2. Contact - Sales, Customer Service & Technical Support Representatives

Telephone: 82-(0)2-727-9467 (Head Office)
82-(0)63-830-7770 (OCI Iksan Plant)
Fax: 82-(0)2-727-9499 (Head Office)
E-mail: pb@oci.co.kr
Website: <http://www.oci.co.kr>
Address: OCI Building, 50, Sogong-dong, Jung-gu,
Seoul, 100-718, Korea

WARRANTY AND LIMITATION

We, OCI makes “**NO WARRANTY OR GUARANTEE**” of any kind, whether written or expressed or implied, including without limitation, any warranty of fitness for a particular purpose, suitability and merchantability, which extends beyond the description of the chemicals hereof.

We, OCI “**WARRANTS ONLY**” to the original customer that the material will **MEET OUR SPECIFICATIONS AT THE TIME OF DELIVERY.**





DC Chemical changes
its corporate name to **OCI Company Ltd.**

After its 50-year history in the chemical industry,
DC Chemical Co., Ltd. is changing
its corporate name to OCI Company Ltd. as of April 1, 2009.

OCI Company Ltd. aims to foster a new corporate image with its new name and CI,
and we will do our utmost to become a global leading chemical company
that produces the world's best products through continued
development and evolution.