IXPER® 75C Calcium Peroxide is a fine, very pale yellow, odorless powder that contains primarily calcium peroxide. IXPER® 75C Calcium Peroxide is mainly used for the enhanced natural attenuation of pollutants in soil and groundwater such as petrochemical spills and other aerobic biodegradable compounds.

**Technical Information**

<table>
<thead>
<tr>
<th>Formula</th>
<th>CaO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS Number</td>
<td>1305-79-9</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>72.08</td>
</tr>
</tbody>
</table>

**Physical Properties**

<table>
<thead>
<tr>
<th>Item</th>
<th>Typical Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Pale yellow amorphous odorless powder</td>
</tr>
<tr>
<td>Mean Particle Size</td>
<td>15μ</td>
</tr>
<tr>
<td>Solubility in Water (20°C)</td>
<td>&lt;0.01%</td>
</tr>
</tbody>
</table>

Other properties can be found in the technical datasheet entitled “IXPER® 75C Calcium Peroxide Properties” posted on the web address at the bottom of this document.

*Give life to earth*

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## Chemical Properties

<table>
<thead>
<tr>
<th>Item</th>
<th>Typical Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium Peroxide (%)</td>
<td>78 ± 2</td>
</tr>
<tr>
<td>Available Oxygen (%)</td>
<td>17.3 ± 0.4</td>
</tr>
<tr>
<td>Stability in water</td>
<td>High stability in suspension</td>
</tr>
<tr>
<td>Transition Metals Impurities</td>
<td>35% Slurry filtrate complies with FL MCL (Max. Contaminant Level) standards for drinking water</td>
</tr>
<tr>
<td>pH (25% suspension)</td>
<td>&gt;12</td>
</tr>
</tbody>
</table>

IXPER® 75C Calcium Peroxide decomposes slowly in contact with water with the generation of oxygen and heat. Typically H₂O₂ is not generated under these conditions due to the high pH.

\[
2\text{CaO}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{Ca(OH)}_2 + \text{O}_2
\]

The rate of gaseous oxygen generation is influenced by the physical and chemical properties of the surrounding medium such as pH, and temperature.

If IXPER® 75C Calcium Peroxide is exposed to a lower pH, it can generate increasing amounts of hydrogen peroxide.

\[
2\text{CaO}_2 + 2\text{H}^+ \rightarrow 2\text{Ca}^{2+} + \text{H}_2\text{O}_2
\]

The difference in behavior of calcium peroxide was observed by testing grades at their natural pH and also by lowering the pH of the medium as discussed below.

A test was done at Western Michigan University comparing the oxygen release profile of several calcium peroxide products using a 1% suspension in water. The flasks were covered with bubble valves for off-gas release without allowing air to enter.

Results show that IXPER® 75C Calcium Peroxide (pH>12) has a slower release profile than the competitor (pH 10.5).

### Slow Oxygen Release Profile of Calcium Peroxide (CaO₂) in Water

IXPER® 75C Outperforms Competitor’s CaO₂ (Powder)
This difference in performance can be attributed to the difference in pH as explained below. The effect of pH on oxygen release was determined by adding sulfuring acid to a 0.2% slurry of IXPER® 75C Calcium Peroxide in water. After proper mixing, the slurry was immediately filtered, and the aqueous phase tested for its H₂O₂ content. Additional acid was then added to the remaining slurry to reach a lower pH, and the process was repeated.

The results of this test show that H₂O₂ generation increases as pH decreases, thus leading to a faster dissolution/decomposition of the calcium peroxide product.

Applications
IXPER® 75C Calcium Peroxide is used for enhanced aerobic bioremediation. This is a process in which organic contaminants found in soil and/or groundwater are degraded by indigenous or inoculated microorganisms transforming them to innocuous end products.

Enhanced bioremediation with the use of IXPER® 75C Calcium Peroxide is achieved through the extended release of oxygen into the subsurface to supplement the rate limiting oxygen requirement by aerobic microorganisms.

The most common pollutants that can be treated include:
- BTEX (benzene, toluene, ethylbenzene and xylenes).
- MTBE (methyl tertiary butyl ether).
- TPH (total petroleum hydrocarbons) from light and heavy fuel oils.
- Non-halogenated volatile solvents such as methylethylketone, methanol, ethanol, acetone, ethyl acetate, acetonitrile, tert-butyl alcohol (TBA), etc.
- Phenols such as phenol and cresols.
- PAHs (polycyclic aromatic hydrocarbons) such as naphthalene and methylnaphthalenes.
- Some halogenated compounds such as vinyl chloride (VC), chlorobenzenes, pentachlorophenol (PCP), etc.
- High explosives.
- Heavy metals can also be oxidized using IXPER® 75C Calcium Peroxide.
There are many factors that affect successful bioremediation using IXPER® 75C Calcium Peroxide. These include:

**Concentration:** IXPER® 75C Calcium Peroxide has a very high active oxygen, typically 17.3% or higher.

**Formulation:** IXPER® 75C Calcium Peroxide has a proven extended oxygen release profile. (see previous graph) In remediation the duration of oxygen release depends upon many factors including soil type, its pH and buffering capacity, kind of contaminants and their concentration, the presence of other organics or metals in the soil, etc.

**Stability:** The stability of calcium peroxide is also a factor of its formulation. A stable product does not release its oxygen immediately in contact with water. This would result in premature loss of oxygen before injection, which leads to excessive foaming. IXPER® 75C Calcium Peroxide is a very stable product with very little foaming propensity when mixed with water.

**Purity:** IXPER® 75C Calcium Peroxide complies with the Food Chemicals Codex for food use. Its high degree of purity further reduces its rate of decomposition, and avoids contamination of the environment.

**Solubility:** IXPER® 75C Calcium Peroxide has a very low solubility in water which allows the product to continue to release its active oxygen content for many months.

**Particle size:** A small particle size is most suitable for producing a homogeneous slurry. It is also essential when the product is to be injected in the soil allowing for greater horizontal penetration in the soil without clogging the pores. The low particle size distribution of IXPER® 75C enables efficient injection into the soil.

**Consistent quality:** The plant producing IXPER® 75C Calcium Peroxide and its quality and management systems are ISO 9001:2000 and 14001:1996 Certified.

All these advantages result in a very slow oxygen profile for IXPER® 75C Calcium Peroxide which translates into enhanced bioremediation.

A laboratory study conducted at Western Michigan University compared the performance of IXPER® 75C Calcium Peroxide with a competitor calcium peroxide. Both products were mixed with a silty clay loam contaminated with diesel fuel. The soil contained 3.6% carbonates and had a pH of 7.9.

Results show that IXPER® 75C Calcium Peroxide outperformed the competitor for the removal of Total Petroleum Hydrocarbons (TPH). The improvement became significantly different after 48 weeks.
The soil pH was also measured in the test. Despite the inherent higher pH for IXPER® 75C Calcium Peroxide (pH 12) vs. the competitor (pH 10.5), the soil pH was only slightly higher for IXPER® 75C Calcium Peroxide, probably due to the buffering capacity of the soil.

Since IXPER® 75C Calcium Peroxide can also generate hydrogen peroxide at the typical soil pHs, this can be exploited by addition of an acid at the time of injection, in order to enhance the release of hydrogen peroxide from the particles. The hydrogen peroxide generated can then perform chemical oxidation reactions such as Fenton’s and modified Fenton chemistry. These reactions would be more efficient at degrading contaminants because hydrogen peroxide is released at the point of contact with contaminants.

Certifications

IXPER® 75C Calcium Peroxide is Kosher certified and complies with the specifications of the Food Chemicals Codex for use in dough conditioning.


Solvay Chemicals, Inc. corporate offices are also 9001:2000 ISO Certified.

Packaging

The product is packaged in 50kg fiberboard boxes. There are 9 boxes to a pallet.

Storage and Handling

- Store in a dry location away from heat and out of direct sunlight in original containers. Storage temperature: <104°F (40°C).
- Store in an area away from acids, bases, metals, metal salts, reducing agents, organic materials or flammable substances.
- Never return unused product to the storage container.
- Equipment used for handling this material should be made of plastic, stoneware, glass or stainless steel. Enameled or resin-coated equipment is also suitable. Copper and copper alloys should be avoided.
- Holding equipment must be adequately vented to prevent any pressure buildup in the event of product decomposition.
Safety

- Ensure all personnel who may come in contact with this material are aware of the potential hazards, first aid measures and the proper storage and use techniques outlined in the most recent Material Safety Data Sheet (MSDS) available on the web site.
- Storage and use areas should be equipped with a safety shower and eyewash station.
- Use appropriate eye and skin protection.
- Dispose of according to applicable federal, state and local regulations.

**Danger:** OXIDIZER – CALCIUM PEROXIDE CAN CAUSE SEVERE EYE DAMAGE AND SKIN IRRITATION. IN CASE OF REPEATED CONTACT WITH SKIN, PRODUCT MAY CAUSE DERMATITIS. Prevent contact with eyes and avoid skin contact. Wash hands and skin thoroughly after handling. Damp product in contact with combustible materials may cause fires.

Water is the preferred extinguishing medium in case of fire involving this product.

First Aid

**Eye contact:** Flush eyes with running water for 15 minutes, while keeping eyelids wide open. Consult with an ophthalmologist in all cases.

**Skin contact:** Wash the affected skin with water. Remove and clean contaminated clothing. Call a physician in case of persistent pain or redness.

**Inhalation:** Remove the victim from the dusty environment. Call a physician in case of respiratory symptoms.

**Ingestion:** Consult with a physician in all cases. DO NOT induce vomiting. If victim is conscious, rinse mouth and give fresh water. Never give anything by mouth to an unconscious person.

Regulatory Information

- DOT Proper Shipping Name: Calcium Peroxide
- DOT Hazard Class: 5.1 (oxidizer)
- UN Code: 1457
- RCRA Waste Number: D001, ignitable
- SARA Section 311/312 hazard category: Fire hazard and immediate health hazard.

Customer Service

The safety of our customers is our highest concern. To discuss safety and handling of IXPER® 75C Calcium Peroxide, contact Solvay Chemicals, Inc. at 1-800-SOLVAY-C (765-8292) or 713-525-6500. 24 hour Emergency Phone Number – 1-800-424-9300
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Before using, read the Material Safety Data Sheet (MSDS) for the chemical.