Introduction
Inorganic peroxides such as IXPER® 75C Calcium Peroxide and IXPER® 35M Magnesium Peroxide products are some of the most temperature stable inorganic peroxides as they decompose at a temperature >370°C. They also have a very low solubility in water with calcium peroxide being slightly more soluble than magnesium peroxide.

The natural pH of a 1% suspension is 10.4-10.8 for IXPER® 35M Magnesium Peroxide and 11.7 for IXPER® 75C Calcium Peroxide. At these pHs, the products slowly decompose in the presence of water to generate oxygen.

$$2\text{CaO}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{Ca(OH)}_2 + \text{O}_2$$
$$2\text{MgO}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{Mg(OH)}_2 + \text{O}_2$$

In pure water, at room temperature, oxygen generation can continue for about 12 months. The rate of oxygen generation can be modified by adjusting the physical and chemical properties of the surrounding medium, such as pH, and temperature.

For example in buffered systems with a substantially lower pH, these products exhibit a different behavior. As the pH drops, the products become more soluble, generating progressively higher ratios of hydrogen peroxide ($\text{H}_2\text{O}_2$) to gaseous oxygen. Under acidic conditions, the available oxygen can be liberated within minutes, mostly in the form of $\text{H}_2\text{O}_2$. 
The hydrogen peroxide generated could lead to competing reactions:

\[
\begin{align*}
\text{H}_2\text{O}_2 + \text{OH}^- & \rightarrow \text{H}_2\text{O} + \text{HOO}^- \\
\text{HOO}^- + \text{substrate} & \rightarrow \text{oxidized substrate} + \text{HO}^- \text{ (oxidation)}
\end{align*}
\]

In the absence of an oxidizable substrate, hydrogen peroxide decomposes:

\[
2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2 \text{ (g) (decomposition)}
\]

The difference in chemical behavior based on the surrounding environment leads to a variety of different applications for the IXPER® products.

For additional information about the properties and hazards of the IXPER® product line, please refer to their respective technical datasheets at www.SolvayChemicals.us.

**Oil & Gas Applications**

In this field, a polysaccharide polymer is often used for hydraulic fracturing of the rock or to form a filter cake. After the polymer achieves its purpose, it must be degraded to lower its viscosity so that it can be easily removed.

Products that are used in this field to degrade these polymers are called breakers. The challenge in the selection of a breaker is to use a product that will remain inactive until the polymer performs its function and then causes a rapid degradation of the polymer.

IXPER® Calcium Peroxide and IXPER® Magnesium Peroxide products have unique advantages in this field. They are very slightly soluble in water and have relatively high stability to decomposition at elevated temperatures. At the desired time, these products can be activated by the addition of an acid or by other means. This results in the generation of hydrogen peroxide which is the actual oxidizing agent.

Several patents and new patent applications claim the use of calcium and magnesium peroxide in this field. The following examples are selected for illustration only. The reader should review the literature for a full list of patents to determine whether the intended application is covered by a patent in the country of application.

**Fracturing fluids**

US 5,253,711 claims the addition of calcium or magnesium peroxide as a component of a fracturing fluid. The products are then activated by heat.

US 7,256,160 and US 6,488,091 claim the use of calcium or magnesium peroxide in fracturing fluids of different compositions and processes.
US 5,624,886 claims the use of alkaline earth metal peroxides for fracturing of subterranean formation. The products are granulated into a pellet or prill.

Filter cake removal
US 5,238,065 claims the destruction of filter cakes using solutions containing calcium or magnesium peroxide together with an acid. The acid activates the peroxide at the desired time.

US 5,697,905 and US 6,494,263 claim the incorporation of magnesium peroxide as a breaker in different filter cake compositions. At the appropriate time, an activator solution is used to release hydrogen peroxide from magnesium peroxide.

US 6,138,760 claims the incorporation of magnesium peroxide in a pre-treatment fluid which is introduced prior to the polymer containing fluid. This enhances degradation of the polymer in the filter cake from the reservoir-side of the filter cake during flow-back of the treatment fluid.

WO 03,054,109 claims the encapsulation of an inorganic peroxide in order to improve its stability while embedded in the filter cake and reduce premature degradation of the polymer. At the appropriate time, pH is decreased in order to activate the inorganic peroxide.

Well cementing
US 5,613,558 claims the use of calcium or magnesium peroxide in a well cementing composition. The composition contains hydraulic cement, and a cement hydration retarder. The role of the peroxide is to degrade the retarder over a period of time.

24 hour Emergency Phone Number – 1-800-424-9300

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