



DISINFECTING COMPOSITIONS FOR POTABLE WATER

Water treatment professionals want a disinfectant that is safe, effective and easy to use. That is why OxyChem's ACL® chlorinated isocyanurates are available for treatment of potable water. ACL products are available as both quick-dissolving granules and long-lasting tablets that offer superior performance.

The Chlorine Advantage

Chlorine is the best overall disinfectant, germicide, algaecide and anti-slime agent available. Numerous laboratory tests and years of use have proven that no other disinfectant can match chlorine's performance in all of these areas. For more than a century, chlorine has been the choice for water treatment, especially drinking water. Over 98% of all municipal water treatment facilities in the United States currently use chlorine.

Whether the source of chlorine is elemental chlorine, sodium hypochlorite (bleach), calcium hypochlorite, or chlorinated isocyanurates (ACL products), all liberate free chlorine when dissolved in water. In solution, free chlorine exists as hypochlorous acid (HOCl), a chemical *with excellent sanitizing and oxidizing properties*. Free chlorine readily kills bacteria, algae, fungi and viruses. It also oxidizes and eliminates organic contaminants and converts some soluble metallic impurities into insoluble solids that can be easily removed by filtration.

What is ACL?

ACL is OxyChem's trade name for a family of chlorinated isocyanurates. These products are dry, highly concentrated chlorine-containing solids that have been used in swimming pools since the 1960s. OxyChem's chlorinated isocyanurates are approved by the U.S. Environmental Protection Agency (EPA) for routine use in potable water and certified under NSF/ANSI Standard 60 (Drinking Water Treatment Chemicals – Health Effects) for use as drinking water additives.

OxyChem markets four solid products for potable water chlorination: ACL 90 Disinfecting Tablets plus ACL 90, ACL 60 and ACL 56 Disinfecting Granules. Each number in the product name reflects the approximate available chlorine content in that material. For example, ACL 90 contains about 90% available chlorine.

OxyChem, the world's largest producer of chlorinated isocyanurates, manufactures these products in ISO 9001:2008 certified plants at Sauget, IL and Luling, LA. We are a proven leader in the industry, with over 50 years of experience in the manufacture and use of chlorinated isocyanurates.

The logo for ACL (Aqua Chlorine) is rendered in a large, bold, black serif font. The letters 'A', 'C', and 'L' are highly stylized, with the 'A' and 'L' featuring decorative flourishes that extend downwards and outwards. A registered trademark symbol (®) is located at the bottom right of the 'L'.

Disinfecting Products

ACL 90

The chemical name for ACL 90 is trichloroisocyanuric acid or “trichlor” for short. ACL 90 has the highest available chlorine content (90%) of any solid oxidizer. It is available in one inch (14 gram) or three inch (200 gram) tablets that dissolve over a period of time for *sustained release*. Used in an automatic feeder, ACL 90 tablets provide a *continuous supply of chlorine* to the water stream, making them especially suitable for continuous feed applications.

ACL 90 is also available as a granular solid that can be fed on either a continuous or intermittent basis with a granular feeder. Granular feeders are particularly suitable for larger applications. Tablet feeders are usually the choice for smaller applications (less than 50 pounds of product per day).

ACL 56 and ACL 60

ACL 56 and ACL 60 are sodium salts of dichloroisocyanuric acid or “dichlor” for short. ACL 56 is a dihydrate with an available chlorine content of 56%. ACL 60 is an anhydrous material with an available chlorine content of 63%.

Both ACL 56 and ACL 60 are quick dissolving granular solids with high solubility in water. They dissolve completely and five times faster than calcium hypochlorite. They are ideal for single dose or intermittent feed applications and also can be used for continuous chlorination with a granular feeder.

ACL 56 and ACL 60 both have an essentially neutral pH. As a result, they have little effect on the treated water’s pH and alkalinity. Calcium hypochlorite and bleach are highly alkaline and may require a pH adjustment with acid.



ACL Properties

Storage and Packaging

ACL products are white, crystalline solids that have excellent stability under proper storage conditions. Unlike sodium hypochlorite bleach, ACL Disinfecting Tablets and Granules maintain their chlorine content almost indefinitely. OxyChem's line of ACL products is available in a wide range of package sizes. ACL 90, ACL 56 and ACL 60 Disinfecting Granules are most commonly sold in 50 lb. pails, while ACL 90 Disinfecting Tablets are typically sold in 55 lb. pails.

Toxicity and Efficacy

Chlorinated isocyanurates liberate cyanuric acid when dissolved in water. Cyanuric acid is an effective chlorine stabilizer in swimming pools. In potable water, it is simply a carrier for the available chlorine, allowing it to exist in a solid, stable, dry and safe-to-handle form.

Extensive studies of cyanuric acid over the past 40 years have supported OxyChem's ACL product registrations with EPA and shown that it is nontoxic. Cyanuric acid is not metabolized in the body. When ingested, it passes unchanged in the urine. Cyanuric acid is not fetotoxic (toxic to fetuses), teratogenic (causing birth defects), mutagenic (causing cell mutations) or carcinogenic and does not bioaccumulate. Despite their similarity in names, cyanuric has NO relation to cyanide. It is neither made from nor will it form cyanide during use.

As part of the extensive review process for approving OxyChem's ACL products for use in potable water, EPA examined both toxicity and efficacy. Based on a comprehensive database for the chlorinated isocyanurates and cyanuric acid, EPA concluded that OxyChem's ACL products are safe and effective for use in treating potable water.

The full text of the approved labels for these products are available at EPA's website:
<http://oaspub.epa.gov/apex/pesticides/f?p=PPLS:1>

Refer to registration numbers 935-40 (for ACL 90 tablets), 935-41 (for ACL 60), 935-39 (for ACL 90 granules) and 935-42 (for ACL 56).

ACL Disinfecting Tablets and Granules also are certified by NSF International under Standard 60 (Drinking Water Treatment Chemicals – Health Effects) for use as drinking water additives. NSF certification is normally a requirement for use in municipal water systems. For more information, refer to NSF International's website at:

<http://www.nsf.org/certified/pwschemicals/>



Certified to
NSF/ANSI 60

Comparison of Chlorine Products

Safety and Handling

Elemental chlorine (in the liquid state) is a relatively inexpensive and stable source of available chlorine. Like other hazardous chemicals, elemental chlorine can have serious consequences if mishandled. Numerous restrictions and regulations apply to ensure the safe handling of elemental chlorine, and these can add significantly to its overall cost. As a result, many municipalities now are searching for effective alternatives for their water treatment needs.

Sodium hypochlorite solution (bleach) is less hazardous than elemental chlorine, but is difficult to handle and has a limited storage life. Spills are hazardous and can be difficult to contain. The available chlorine content of bleach is 15% or less. Added costs for equipment and shipping large amounts of such a dilute product can add significantly to its overall cost.

Solid disinfectants such as the ACL products have a safety advantage over gaseous and liquid materials since spills or leaks are much easier to contain and clean up.

Calcium hypochlorite contributes to scaling or cloudiness in the treated water and can produce calcium sludge in the feeder. It can also be a fire hazard and is classified as a Class 3 Oxidizer by the National Fire Protection Association (NFPA)¹. Calcium hypochlorite has a tendency to lose available chlorine over time. In addition, if stored

above 125°F (52°C) for an extended period, it will decompose in a self-sustained reaction.

ACL 90 is classified as a Class 1 Oxidizer by NFPA. This lower rating reflects the fact that ACL 90 does not burn or decompose unless a direct flame or other intense heat source is applied. Upon removal of the flame or heat source, ACL 90 will stop decomposing.

ACL 60 is an NFPA Class 2 Oxidizer and is stable at higher temperatures than calcium hypochlorite. While **ACL 56** is a Class 1 Oxidizer under NFPA, it is not classified as an oxidizer by the United States Department of Transportation (DOT).

The oxidizing power of the chlorine contained in OxyChem's ACL products makes them excellent disinfectants and reactive compounds. It is important to handle and store these products properly so they stay uncontaminated and dry until use.

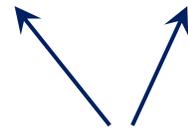
Proper handling and storage of these products will avoid contamination and keep them dry until use. Mixing ACL products with other materials or small amounts of water could initiate a chemical reaction. The Safety Data Sheets (SDSs) and product labels for these products contain detailed guidelines for their safe handling and storage.

¹ NFPA 400 Hazardous Materials Code, National Fire Protection Association, Inc., 1 Batterymarch Park, Quincy, MA 02269 USA

Key *ACL*® Advantages

Summary of Chlorine Products for Water Treatment

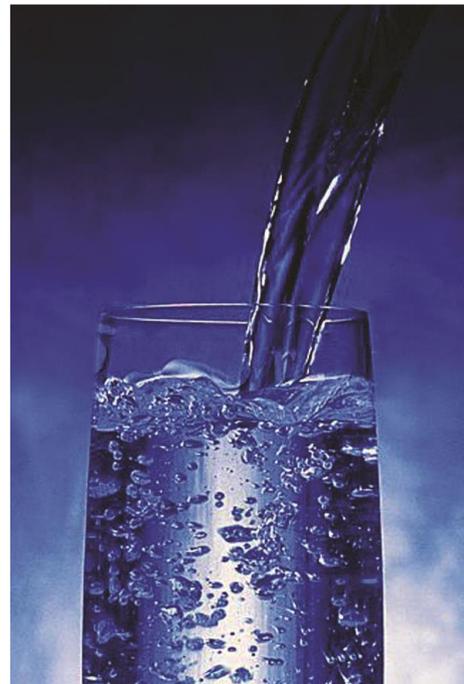
Property	Elemental Chlorine	Calcium Hypochlorite	Liquid Bleach	ACL 90	ACL 56 ACL 60
High chlorine content	✓			✓	
Easy to use		✓		✓	✓
No cloudy water	✓		✓	✓	✓
No scaling	✓		✓	✓	✓
Long storage life	✓	✓		✓	✓
No messy spills		✓		✓	✓
Safe to store and handle				✓	✓
Less total dissolved solids	✓	✓		✓	✓



DISINFECTING COMPOSITIONS FOR POTABLE WATER FROM **OxyChem**®

Key ACL Advantages

There are distinct differences in chlorine sources for water treatment. ACL's key advantages are that they are safe, easy to use and dissolve completely to leave the water perfectly clear. They do not cloud the water or promote calcium scaling in either feed equipment or the treated water. ACL 90 Disinfecting Tablets provide uniform chlorine feed rates even in intermittent feed operations and are consistent from pail to pail. ACL products release their available chlorine very rapidly in water, even at low temperatures.



ACL Disinfecting Tablets and Granules Offer Superior Performance, Safety and Convenience

- **A family of dry, highly concentrated chlorine-containing solids which are safe to store and handle**
- **Available in durable tablets or quick-dissolving granules for sustained release, continuous output, single dose, or intermittent feed applications**
- **Approved by the U.S. EPA for routine use in potable water**
- **Certified under NSF/ANSI Standard 60 for use as drinking water additives**
- **Dissolves completely, with no cloudy water, scaling or sludge**





**ACL Chlorinated
Isocyanurates Division**
Occidental Chemical Corporation
5005 LBJ Freeway
Dallas, Texas 75244
Toll-free: (800) 578-8880
Tel: (972) 404-3800
Fax: (972) 404-4815
www.oxy.com

Technical Service
Occidental Chemical Corporation
520 Monsanto Avenue
Sauget, IL 62206
Toll-free: (800) 733-1165, Option 4
Tel: (618) 482-6503
Fax: (618) 482-6588

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