



**POOL &
HOT TUB
ALLIANCE**

Fact Sheet

Brought to you by the PHTA Recreational Water Quality Committee

Potassium Monopersulfate (KMPS)

March 2019

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I. INTRODUCTION

The purpose of this fact sheet is to provide a brief technical overview of the chemical product potassium monopersulfate (monopersulfate, KMPS or MPS), which is marketed for use in the treatment of water in swimming pools, spas, and hot tubs.

II. SUMMARY OF CHARACTERISTICS

- A powerful non-chlorine oxidizer (does not contain chlorine).
- KMPS uses reactive oxygen (“Active Oxygen”) to destroy contaminants in pool and spa water such as those found in sweat, urine and wind-blown debris.
- Since it is chlorine free, KMPS will not form combined chlorine or chloramine irritation and odor.
- Proper application gives excellent water clarity.
- Completely soluble in pool and spa/hot tub water.
- Does not contain stabilizer (cyanuric acid) or calcium.
- May reduce alkalinity and pH over time.
- Addition of KMPS temporarily increases Oxidation-Reduction Potential (ORP).

III. GENERAL DESCRIPTION (*What It Is – What It Does – What It Does Not Do*)

Potassium monopersulfate is a white, granular, free-flowing peroxygen that provides powerful non-chlorine oxidation for a wide variety of industrial and consumer uses. Potassium monopersulfate is the active ingredient in most non-chlorine oxidizers used for pool and spa/hot tub oxidation. Most non-chlorine oxidizers contain 45% of the active ingredient potassium monopersulfate, but blended compositions are also commercially available that may contain buffers, clarifiers, and/or additives for control of algae.

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Potassium monopersulfate is readily soluble in water. The oxidizing power of monopersulfate is derived from its peracid chemistry; it is the first neutralization salt of peroxymonosulfuric acid H_2SO_5 (also known as Caro's acid). It is an effective oxidizer across a broad pH range from 2-12. The standard electrode potential (E°) of $KHSO_5$ is 1.85V, high enough for many room temperature oxidation reactions, including halide to halogen and oxidation of reduced sulfur and nitrogen compounds. These properties make monopersulfate a useful oxidizer for pool and hot tub water.

Potassium monopersulfate is not a sanitizer or algaecide and must be used in conjunction with an EPA registered sanitizer. Swimming pool and hot tub water can be effectively managed by providing adequate sanitation, effective oxidation, and proper water balance. The role of monopersulfate in pool and spa water treatment is to provide effective non-chlorine oxidation, in other words, to react with organic contaminants, and maintain or restore excellent water clarity.

Non-chlorine oxidizers, like similar chlorine products, are intended to be used for supplemental treatment. They provide supplemental oxidation of contaminants to reduce the demand on the primary sanitizer. Monopersulfate is an alternative to chlorine oxidizers for applications when raising the chlorine residual (from chlorination) is not desired. Since the oxidation chemistry from monopersulfate is performed by "Active Oxygen", it reacts with contaminants without using additional chlorine.

IV. APPLICATION

Always follow label directions when using potassium monopersulfate products to treat swimming pool and spa/hot tub water. Potassium monopersulfate is compatible with all sanitizer products and systems. When used with biguanide (PHMB) systems, follow the biguanide manufacturers' specific recommendations for the use of potassium monopersulfate. It is recommended for use in indoor and outdoor residential and commercial venues.

While there is not a specific test to determine when and how much monopersulfate should be applied, there are guidelines that can be followed to ensure proper use. The primary parameters to be tested are free and combined chlorine. Free chlorine should always be tested, and adjusted if necessary, to ensure proper sanitizer levels. Testing combined chlorine indicates the level of contaminants bound to chlorine, and the need for supplemental oxidation.

Pool and hot tub water should be properly balanced. This requires testing of the pool water balance parameters of pH, carbonate alkalinity, calcium hardness, and stabilizer (i.e., cyanuric acid). In addition to testing the standard parameters, an overall assessment of pool and hot tub water and air quality should be performed. Poor water quality and/or apparent chloramine odor, are key indicators that oxidation is required.

Regular oxidation with potassium monopersulfate will help manage combined chlorine levels and problems associated with chloramines.

In the N,N-diethyl-p-phenylenediamine (DPD) and ferric ammonium sulfate (FAS)-DPD test methods, any residual potassium monopersulfate will test as combined chlorine. This occurs because MPS reacts with potassium iodide in the DPD#3 reagent, thereby converting iodide to iodine, which reacts with excess

DPD to produce a red coloration. To alleviate this issue, the following actions are recommended; 1) always test before adding monopersulfate, 2) add monopersulfate in the evening and test the following morning, 3) use a test kit that includes a reagent to neutralize residual monopersulfate in the DPD test series, or 4) use a test kit or strip that does not have this interference.

V. PRECAUTIONS

In order to safely use and handle potassium monopersulfate products, all individuals involved in their manufacture, distribution, sale, or use should be trained and knowledgeable about their properties. Safety information is available on the product label, SDS (Safety Data Sheet), and the manufacturer's product literature. This safety information will include product and packaging disposal instructions and spill response information.

Potassium monopersulfate is a dry solid with strong oxidizing properties. It is very stable when stored in a cool, dry, ventilated area and not contaminated by other chemicals such as alkalis or easily oxidizable materials. Monopersulfate should not be mixed with other pool chemicals. Partially empty packages must not be combined, as this could result in dangerous mixing with incompatible materials having a similar appearance.

CAUTION: If mishandled, improperly stored, or contaminated, monopersulfate products can become unstable and dangerous, as is the case in general with oxidizing agents. Fire and/or evolution of toxic gases could result, depending on the nature and amount of the contaminant.

As with any oxidizer, monopersulfate can oxidize metals and may result in staining of pool and hot tub surfaces. When used with mineral systems, check manufacturers' directions for use.

VI. REFERENCES

1. Appendix A, ANSI/APSP/ICC-1 *Standard for Public Swimming Pools*, ANSI/NSPI-2 *Standard for Public Spas*, ANSI/APSP/ICC-3 *Standard for Permanently Installed Residential Spas and Swim Spas*, ANSI/APSP/ICC-4 *Standard for Aboveground/Onground Residential Swimming Pools*, ANSI/APSP/ICC-5 *Standard for Residential Inground Swimming Pools*, ANSI/APSP/ICC-6 *Standard for Residential Portable Spas and Swim Spas*, Pool & Hot Tub Alliance, 2111 Eisenhower Ave., Alexandria, Virginia 22314.
2. ANSI/APSP/ICC-11 *Standard for Water Quality in Public Pools and Spas*, Pool & Hot Tub Alliance, 2111 Eisenhower Ave., Alexandria, Virginia 22314
3. D.H. Fortnum, et al., "The Kinetics of the Oxidation of Halide Ions by Monosubstituted Peroxides", *J. Am. Chem. Soc.*, 82, 778-782 (1960).
4. R.J. Kennedy and A.M. Stock, "The Oxidation of Organic Substances by Potassium Peroxymonosulfate", *J. Org. Chem.*, 25, 1901-1906 (1960).
5. H. Hussain, et al., "Journey Describing Applications of OXONE in Synthetic Chemistry", *Chemical Reviews*, 113, 3329-3371 (2013).
6. "Potassium Monopersulfate" in *Essential Reactions for Organic Synthesis*, P.L. Fuchs, ed., 1st edition, John Wiley & Sons, Ltd., 334-352 (2016).
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