PERSULFATES TECHNICAL INFORMATION

Evonik: your most valued supplier for quality, reliability, and service

Leading Beyond Chemistry

Evonik is one of the world's leading producers of peroxygens.

Evonik's Active Oxygens business line has production facilities at 18 locations around the world. Its plants can be found in Europe, North America, South America, Africa, Asia, and Oceania, ensuring ready availability no matter where a customer is located.

We are a leading global supplier of peroxydisulfates, a group of chemicals commonly referred to as persulfates.

Evonik is the only persulfates producer in North America and provides a reliable supply of high-quality, stable persulfates to the global market. Our plant in Tonawanda, New York, is an ISO-9002 certified facility located near the Niagara River, which provides a reliable supply of hydro-electric power and cooling water.

We have been a market leader for decades, yet we continually find ways

CONTENTS

to improve our products, especially their safety. Our research into the characteristics of peroxydisulfates has improved the quality and the stability of all Evonik persulfates. An understanding of the crystalline structure of persulfates and the interplay with heat and moisture have informed our quality control procedures, manufacturing processes, and storage requirements for these products. We have established up-to-date specifications for thermal stability which make persulfates among the most stable available. Persulfates are strong oxidants, have an excellent shelf life when stored properly, and are economical to use. These properties make persulfates suitable for a variety of applications.

At Evonik Active Oxygens, sustainability is at the core of futurizing our business.

Learn more at
evonik.com/activeoxygens

APPLICATIONS & CHEMISTRY

APPLICATIONS

Persulfates are key components in many industrial processes and commercial products. The polymer industry uses aqueous solutions of persulfates as initiators in the polymerization of latex and synthetic rubber. The electronics industry considers sodium persulfate an efficient microetchant in the manufacture of printed circuit boards. The following examples further illustrate the chemical versatility of persulfates.

POLYMERIZATION

- **Plastics and Rubber:** Ammonium, potassium, and sodium persulfates are used as initiators for emulsion polymerization reactions in the preparation of acrylics, polyvinyl chlorides, polystyrenes, and neoprene. They are used as polymerization initiators in the manufacture of synthetic rubber (styrene butadiene and isoprene) for automobile and truck tires. Persulfate initiation is used to prepare latex polymers for paints, coatings, and carpet backing.

- **Structural Materials:** Persulfates are used as initiators in polymeric concrete formulat ions.

- **Inorganic Chemicals and Minerals:** Persulfates are also initiators for the polymeric coating of graphite filaments.

- **Soil Stabilization:** Ammonium persulfate is used as a curing agent in chemical grout systems used to stabilize soil near dams, tunnels, and buildings.

OXIDATION

- **Surface Preparation:** The oxidation power of persulfates is used to clean and microetch a variety of printed circuit board substrates. Persulfates are important oxidants in plating and coating processes. They are also etchants for nickel, titanium, and zinc alloys. Persulfates are used to clean and mill aluminum, brass, copper, and many other metal surfaces prior to plating or adhesive bonding. Persulfates are used to clean and activate carbon and charcoal before and after their use as absorbents.

- **Cosmetics:** The cosmetic industry has developed formulations which use persulfates to boost hair bleaching performance.

- **Organic Synthesis:** Persulfates are oxidizing agents in the preparation of aldehydes, ketones, carboxylic acids, quinones, and a variety of other compounds. The pharmaceutical industry uses sodium persulfate as a reagent in the preparation of antibiotics.

OTHER APPLICATIONS

- **Adhesive:** Persulfates are used in the preparation of adhesive films and metal bonding adhesives.

- **Gas and Oil Production:** In enhanced oil recovery, persulfates are used “down hole” for gel forming and breaking.

- **Inks, Pigments and Dispersants:** Persulfates are used to graft substrates to polymers (for example, carbon black to sodium acrylate). Persulfates are used in the preparation of dispersants for ink jetting and toner formulations.

- **Mining:** Persulfates can be used in nickel and cobalt separation processes.

- **Peroxymonosulfate:** We have developed a process using ammonium and sodium persulfates to prepare peroxymonosulfate solutions. This patented process allows fast, efficient, on-site production of an alternative to Caro’s acid and potassium caroate.

- **Photography:** Persulfates are used in many photographic applications, including bleaching solutions, solution regeneration, equipment cleaning, and wastewater treatment.

- **Pulp and Paper:** Persulfates are used in the sizing of paper, preparation of binders and coatings, and production of special papers. An activated alkali metal persulfate effectively repulps neutral / alkaline wetstrength broke and decolorizes dyes and optical brightener.

- **Textiles:** Ammonium and sodium persulfates are used in the desizing and bleaching of textiles and the development of dyestuffs.

- **Environmental:** Persulfates are very strong oxidants, have excellent shelf life when stored properly, and are economical to use. These properties make persulfates suitable for a variety of environmental applications, such as soil remediation and wastewater/groundwater cleanup.

APPLICATIONS & CHEMISTRY

OXIDATION CHEMISTRY

The persulfate anion is the most powerful oxidant of the peroxygen family of compounds.

The electromotive force data listed below compares three commonly used peroxygens:

$$S_2O_8^{-2} + 2H^+ + 2e^- \longrightarrow 2HSO_4^- \qquad E = 2.12V$$

$$H_2O_2 + 2H^+ + 2e^- \longrightarrow 2H_2O \qquad E = 1.77V$$

$$HSO_5^- + 2H^+ + 2e^- \longrightarrow HSO_4^- + H_2O \qquad E = 1.44V$$

Many metals are oxidized by persulfate to form soluble metal sulfates, for example, copper:

$$Cu + S_2O_8^{-2} \longrightarrow CuSO_4 + SO_4^{-2}$$

Under certain circumstances, hydrolysis of the persulfate anion will yield the bisulfate anion and hydrogen peroxide a kinetically faster oxidant than persulfate:

$$S_2O_8^{-2} + 2H_2O \xrightarrow{H+} 2HSO_4^{-2} + H_2O_2$$

Another reaction of note is the acid-catalyzed hydrolysis of persulfate to form peroxymonosulfate anion. Fast, high-temperature, acid hydrolysis followed by thermal quenching will yield solutions of peroxymonosulfate:

$$S_2O_8^{-2} + H_2O \longrightarrow HSO_4^- + HSO_5$$

The resulting solution is a useful replacement for Caro's acid, H_2SO_5 and potassium caroate, $KHSO_5$. Reactions at different pH:

NEUTRAL (PH 3 TO 7)

$$S_2O_8^{-2} + H_2O \longrightarrow 2HSO_4^- + ½O_2$$

DILUTE ACID (PH > 0.3; [H+] < 0.5M)

$$S_2O_8^{-2} + 2H_2O \longrightarrow 2HSO_4^- + H_2O_2$$

STRONG ACID ([H+] > 0.5M)

$$S_2O_8^{-2} + H_2O \longrightarrow 2HSO_4^- + HSO_5^-$$

ALKALINE (PH > 13)

$$S_2O_8^{-2} + OH^- \longrightarrow HSO_4^- + SO_4^{-2} + ½O_2$$

FREE RADICAL CHEMISTRY

Persulfates produce free radicals in many diverse reaction situations.

When solutions of the persulfates are heated, free radicals are formed:

$$S_2O_8^{-2} + \text{Heat} \longrightarrow 2SO_4^{\bullet-}$$

In the presence of suitable monomers, the radical anions act as polymerization initiators to produce polymer molecules:

$$SO_4^{\bullet-} + nCH_2 = \underset{R}{CH} \longrightarrow {}^{-}O_3SO(CH_2(\underset{R}{CH_2}(CH)^{n-1}(\underset{R}{CH_2}C^{\bullet}H)$$

Free radicals suitable as polymerization initiators are also generated in the presence of reducing agents, for example, the bisulfite anion:

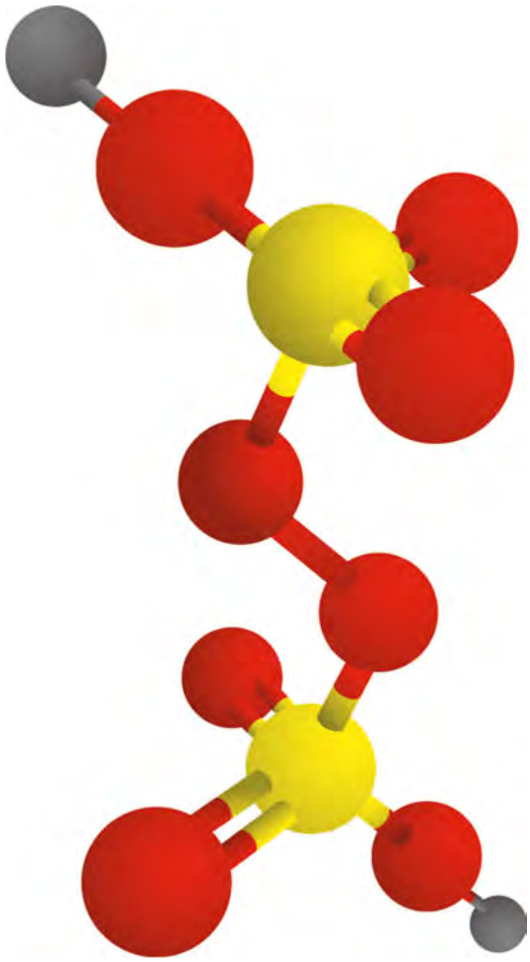
$$S_2O_8^{-2} + HSO_{3^-} + \tfrac{1}{2}O_2 \longrightarrow HSO_{4^-} + 2SO_4^{\bullet-}$$

Free radicals can also be generated in the presence of transition metals:

$$S_2O_8^{-2} + Fe^{+2} \longrightarrow Fe^{+3} + SO_4^{-2} + SO_4^{\bullet-}$$

and mercaptans:

$$S_2O_8^{-2} + 2RSH \longrightarrow 2HSO_4^{-} + 2RS^{\bullet}$$



Persulfate Chemical Structure

PHYSICAL & CHEMICAL DATA

PHYSICAL AND CHEMICAL PROPERTIES OF PERSULFATES

Physical and chemical studies of persulfates provide the data for this section.

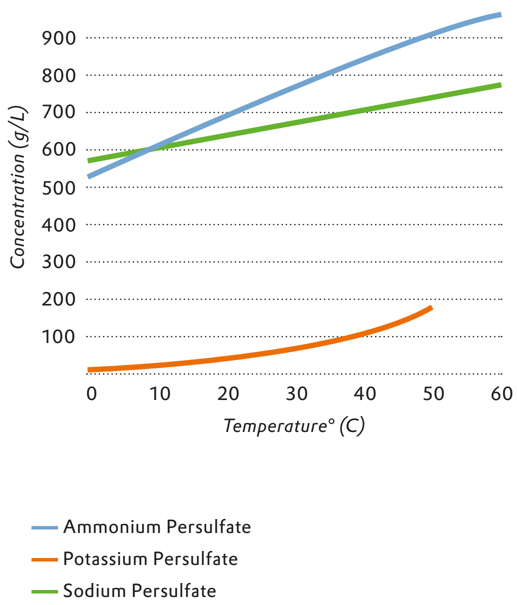
You will find the data useful for applying persulfate chemicals to various processes and products. The density, viscosity, electrical conductance, and solution heat capacity data are presented in graphic and equation form. This format enables you to view the general trend of the physical data. Then, with the aid of equations, you can calculate the correct values for your application.

Common Name	Ammonium Persulfate	Potassium Persulfate	Sodium Persulfate
Chemical Name	Ammonium Peroxydisulfate	Potassium Peroxydisulfate	Sodium Peroxydisulfate
Physical Form	Crystalline (monoclinic)	Crystalline (triclinic)	Crystalline (monoclinic)
Formula	$(NH_4)_2S_2O_8$	$K_2S_2O_8$	$Na_2S_2O_8$
Molecular Weight	228.2	270.3	238.1
Crystal Density (g/cc)	1.98	2.48	2.59
Color	Off-white	Off-white	White
Odor	None	None	None
Loose Bulk Density (g/cc)	1.05	1.30	1.12

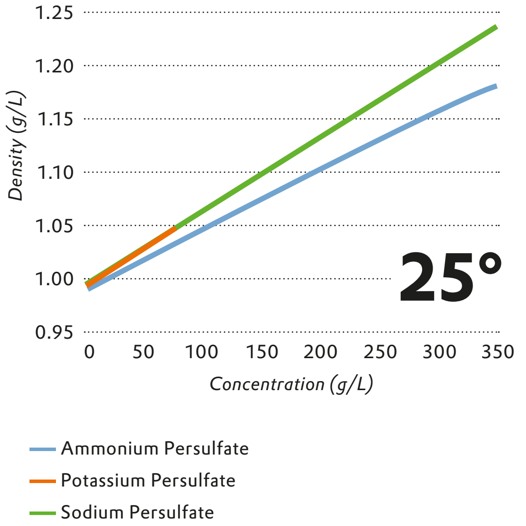
Maximum solubility of Persulfate salts in water

Solubility (g/100g of H_2O)	Ammonium Persulfate	Potassium Persulfate	Sodium Persulfate
25° C	85	6	73
50° C	116	17	86

Solubilities of Persulfates Salts



Density of Aqueous Solutions



Equation for calculation of density

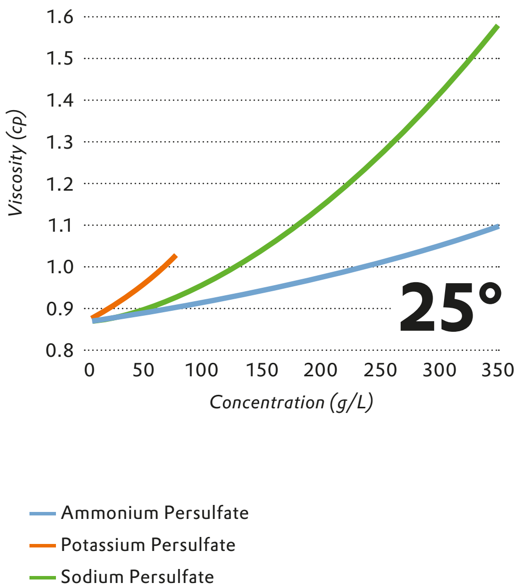
Density (g/mL) = density H_2O + (A/1000)X + (B/1000)$X^{1.5}$,
where X = solution concentration in grams per liter (g/L).

Salt	Constant	25° C	35° C	45° C
Ammonium	A	0.4903	0.4860	0.4789
	B	-2.6730x10^{-4}	-7.6254x10^{-4}	-5.0971x10^{-4}
Potassium	A	0.6368	0.6273	0.6294
	B	-1.4934x10^{-3}	-8.1965x10^{-4}	-1.6472x10^{-3}
Sodium	A	0.6709	0.6727	0.6610
	B	-1.4934x10^{-3}	-1.4909x10^{-3}	-1.0038x10^{-3}

Density of water

	25° C	35° C	45° C
Density H_2O	0.99707	0.99406	0.99025

Viscosity of Aqueous Solutions



Equation for calculation of viscosity

Viscosity (cp) = viscosity H_2O + $CX^{0.5}$ + DX + $EX^{1.5}$,
where X = solution concentration in grams per liter (g/L).

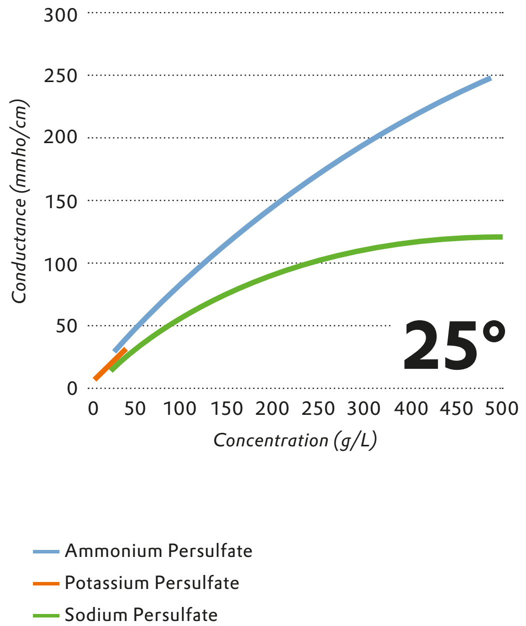
Salt	Constant	25° C	35° C	45° C
Ammonium	C	-1.0686x10^{-3}	6.8050x10^{-3}	5.3134x10^{-3}
	D	1.7140x10^{-4}	-9.4542x10^{-4}	-5.8450x10^{-4}
	E	2.4670x10^{-5}	5.9785x10^{-5}	4.5080x10^{-5}
Potassium	C	0	5.9187x10^{-3}	3.5413x10^{-3}
	D	1.0661x10^{-3}	-1.0551x10^{-3}	-9.5623x10^{-5}
	E	9.8884x10^{-5}	1.0674x10^{-4}	1.2477x10^{-5}
Sodium	C	4.3857x10^{-3}	6.1743x10^{-3}	1.3461x10^{-2}
	D	-1.2218x10^{-3}	-4.6619x10^{-4}	-1.9741x10^{-3}
	E	1.5146x10^{-4}	8.1093x10^{-5}	1.3540x10^{-4}

Viscosity of water

	25° C	35° C	45° C
Viscosity H_2O	0.8904	0.7194	0.5960

PHYSICAL & CHEMICAL DATA

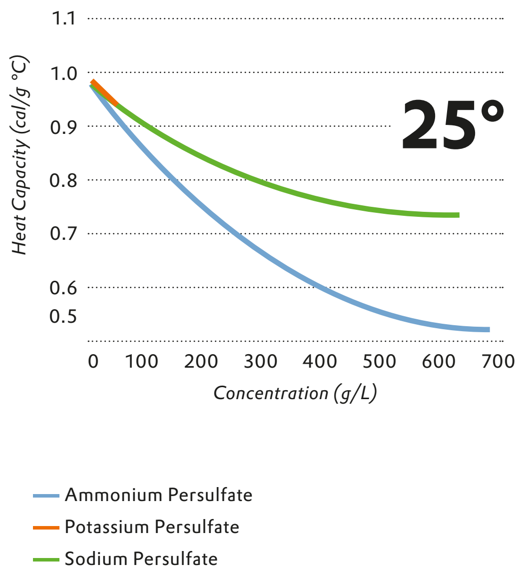
Electrical Conductance of Aqueous Solutions



Equation for calculation of electrical conductance
Conductance (mmho/cm) = F + GX + HX^2,
where X = solution concentration in grams per liter (g/L).

Salt	Constant	25° C	35° C	45° C
Ammonium	F	3.9016	6.6081	6.2538
	G	0.8568	0.9804	1.1578
	H	$6.2904x10^{-4}$	$-7.1312x10^{-4}$	$-8.8912x10^{-4}$
Potassium	F	2.9603	3.7314	4.1673
	G	0.6704	0.7972	0.9525
	H	$-1.0456x10^{-3}$	$-1.1982x10^{-3}$	$-1.9173x10^{-3}$
Sodium	F	5.9501	7.1826	8.1825
	G	0.5880	0.6967	0.8123
	H	$-6.6193x10^{-4}$	$-7.5821x10^{-4}$	$-8.6226x10^{-4}$

Heat Capacity of Aqueous Solutions

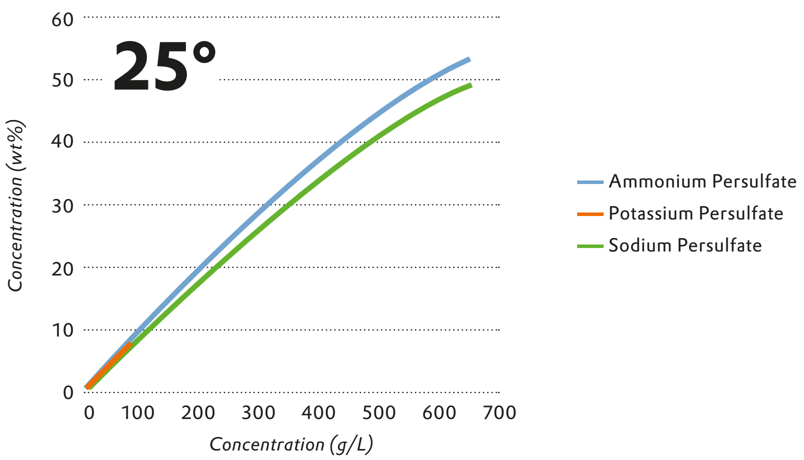


Equation for calculation of heat capacity
Heat capacity (cal/g °C) = K - LX + $MX^{1.5}$, where
X = solution concentration in grams per liter (g/L).

Salt	Constant	25° C
Ammonium	K	0.994
	L	$-1.863x10^{-3}$
	M	$4.531x10^{-5}$
Potassium	K	0.997
	L	$1.150x10^{-3}$
	M	$2.670x10^{-5}$
Sodium	K	0.997
	L	$1.190x10^{-3}$
	M	$3.112x10^{-5}$

Conversion $$cal/g\ ^{\circ}C = \frac{Btu/lb\ ^{\circ}F = J/g\ ^{\circ}C}{4.184}$$

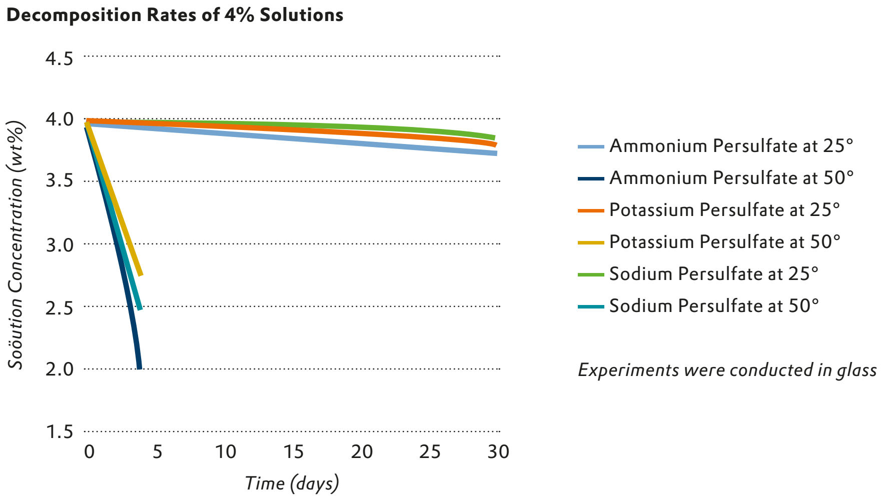
Conversion: Grams/Liter to Weight %

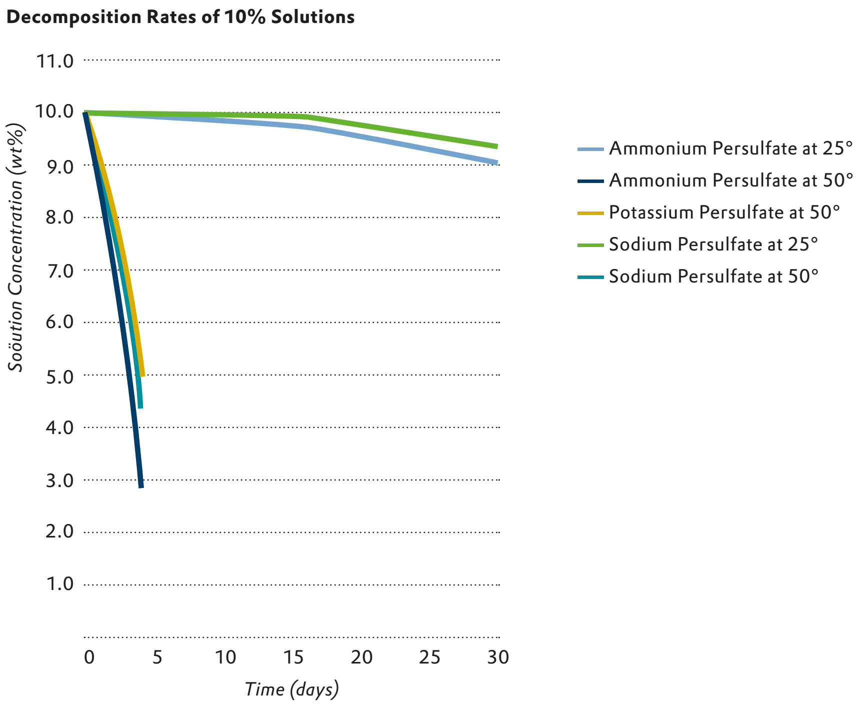


	Ammonium Persulfate			Potassium Persulfate			Sodium Persulfate		
G/L	**25° C**	**35° C**	**45° C**	**25° C**	**35° C**	**45° C**	**25° C**	**35° C**	**45° C**
0	0	0	0	0	0	0	0	0	0
25	2.477	2.485	2.495	2.468	2.476	2.486	2.466	2.474	2.484
50	4.895	4.911	4.931	4.861	4.877	4.896	4.854	4.868	4.888
75	7.256	7.281	7.311	7.183	7.208	7.237	7.167	7.187	7.219
100	9.562	9.598	9.635	—	9.470	9.510	9.410	9.435	9.479
125	11.815	11.863	11.912	—	11.668	11.719	11.586	11.616	11.672
150	14.017	14.077	14.136	—	—	13.868	13.699	13.733	13.801
175	16.170	16.244	16.311	—	—	15.959	15.751	15.790	15.870
200	18.275	18.364	18.440	—	—	17.994	17.745	17.788	17.880
250	22.349	22.471	22.564	—	—	—	21.572	21.620	21.738
300	26.251	26.411	26.519	—	—	—	25.197	25.250	25.394
350	29.993	30.194	30.316	—	—	—	28.634	28.695	28.864
400	33.583	33.831	33.964	—	—	—	31.910	31.969	32.164
450	37.031	37.329	37.473	—	—	—	35.026	35.087	35.307
500	40.346	40.699	40.850	—	—	—	37.998	38.060	38.305
550	43.536	43.946	44.104	—	—	—	40.836	40.898	41.168
600	46.607	47.079	47.241	—	—	—	43.551	43.613	43.905
650	49.566	50.103	50.268	—	—	—	46.150	46.211	46.527
700	52.420	53.025	53.191	—	—	—	48.642	48.702	49.040

***Note:** Potassium persulfate is the least soluble of Evonik's persulfate salts*

PHYSICAL & CHEMICAL DATA





TYPICAL ANALYSIS OF PERSULFATES

Analysis	Ammonium Persulfate	Potassium Persulfate	Sodium Persulfate
Purity (%)	99.5	99.5	99.7
Active oxygen (%)	6.98	5.90	6.68
Moisture (%)	0.02	0.02	0.01
Ammonium persulfate (%)	—	0.14	0.01
Sodium sulfate (%)	—	—	0.70
pH (1% solution)	5.2	6.4	6.0
Iron (ppm)	1	3	2
Insolubles (ppm)	21	18	29
Copper (ppm)	<0.3	<0.2	<0.2
Chloride (ppm)	<10	<10	<10
Heavy metals, as lead (ppm)	<1	<1	<1
Manganese (ppm)	<0.5	<0.5	<0.5
Chromium (ppm)	<0.5	<0.5	<0.5
Sodium (ppm)	20	—	—
Potassium (ppm)	50	—	—

PHYSICAL & CHEMICAL DATA

ANALYTICAL CHEMISTRY

Persulfates or their solutions can be conveniently assayed by the methods described below. In each method, persulfate is determined by titration of a standardized potassium permanganate or ceric ammonium sulfate solution with a standardized ferrous ammonium sulfate solution, a backtitration technique. Reagents can be purchased prestandardized or prepared from commercially available chemicals. All reagents, chemicals, and apparatus used are common, off-the-shelf items, and can be purchased from commercial supply houses.

ASSAY PROCEDURES

Solids

To a 250 mL Erlenmeyer flask, add about 1 gram of sample weighed to the nearest milligram and about 50 mL of 1N H_2SO_4. Dissolve the sample and add exactly 40 mL of 0.5 N ferrous ammonium sulfate solution. Swirl constantly while adding the ferrous ammonium sulfate solution.

Let this stand for one minute and titrate with 0.5 N $KMnO_4$ to permanent pink endpoint or with 0.5 N $Ce(SO_4)^2$ to a Ferroin indicator endpoint. The calculations require a blank titration on exactly 40 mL of ferrous ammonium sulfate solution, as used above, in 50 mL of the 1 N H_2SO_4.

$$\%\text{ active oxygen} = \frac{(A - B)C \times 0.8}{D}$$

$$\%\text{ ammonium persulfate} = \frac{(A - B)C \times 11.4}{D}$$

$$\%\text{ potassium persulfate} = \frac{(A - B)C \times 13.5}{D}$$

$$\%\text{ sodium persulfate} = \frac{(A - B)C \times 11.9}{D}$$

A = mL $KMnO_4$ or $Ce(SO_4)^2$ solution used for titrating the blank.
B = mL $KMnO_4$ or $Ce(SO_4)^2$ solution used for titrating the sample.
C = Normality of the $KMnO_4$ or $Ce(SO_4)^2$ solution used.
D = Weight of sample in grams.

Solutions

To a 250 mL Erlenmeyer flask, pipette 2-20 mL of persulfate solution (depending on the approximate solution concentration). Add about 50 mL of about 1 N H_2SO_4 solution. Add exactly 40 mL of 0.5 N ferrous ammonium sulfate solution. Swirl constantly while adding the ferrous ammonium sulfate solution.

Let stand for one minute and titrate with 0.5 N $KMnO_4$ to a permanent pink endpoint or with 0.5 N $Ce(SO_4)^2$ to a Ferroin indicator endpoint. The calculations require a blank titration on exactly 40 mL of ferrous ammonium sulfate solution, as used above, in 50 mL of the 1 N H_2SO_4.

$$\text{g/L active oxygen} = \frac{(A - B)C \times 8}{D}$$

$$\text{g/L ammonium persulfate} = \frac{(A - B)C \times 114}{D}$$

$$\text{g/L potassium persulfate} = \frac{(A - B)C \times 135}{D}$$

$$\text{g/L sodium persulfate} = \frac{(A - B)C \times 119}{D}$$

A = mL $KMnO_4$ or $Ce(SO_4)^2$ solution used for titrating the blank.
B = mL $KMnO_4$ or $Ce(SO_4)^2$ solution used for titrating the sample.
C = Normality of the $KMnO_4$ or $Ce(SO_4)^2$ solution used.
D = Weight of sample in grams.

GENERAL MATERIAL INFORMATION

Persulfate Handling and Safety
Persulfates are oxidizing chemicals that require careful attention to all aspects of handling and use. For more information, you may request a Safety Data Sheet (SDS) which is available from any Evonik office and on our website at active-oxygens.com.

Personal Protective Equipment
When handling persulfate chemicals, follow the guidelines listed here and in the SDS.

- **Protect your eyes:** Wear chemical-type goggles or a face mask whenever splashing, spraying, or any eye contact is possible.
- **Protect your respiratory system:** Use dust respirators approved by NIOSH/MSA whenever exposure may exceed the established standard listed in the current SDS.
- **Protect your hands:** Wear general purpose neoprene gloves.
- **Protect yourself with proper clothing:** Wear ordinary work clothes with long sleeves and full-length pants.
- **Protect yourself with proper footwear:** Wear shoes with neoprene soles.

First Aid

- **Eye contact:** Flush with water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.
- **Skin contact:** Wash with plenty of soap and water. If irritation occurs and persists, obtain medical attention. Wash clothing before reuse.
- **Inhalation:** Get fresh air. If breathing difficulty or discomfort occurs, call a physician.
- **Ingestion:** Drink one to two glasses of water. Do not induce vomiting. Do not give anything by mouth to an unconscious individual. Call a physician immediately.

When properly handled and stored, persulfates and their solutions do not present serious health hazards. The SDS provides information concerning exposure, emergency, first aid, and disposal of persulfates.

Storage
Persulfates should be stored in accordance with the National Fire Protection Association (NFPA) 400 Hazardous Materials Code. Evonik personnel can provide additional support in reviewing storage facilities.

- **General precautions:** Persulfates should be kept in a cool, dry storage area, in a configuration that is appropriate for the sprinkler capacity of the building per NFPA 400. Personnel should be trained to handle persulfates safely, properly dispose of spilled materials and prevent contamination. If material gets wet or spills, it must be isolated and disposed of properly.
- **Handling:** To remove and transport persulfates from the shipping containers, use clean plastic or stainless steel scoops, shovels, pails, etc. Cleanliness is essential.
- **Solution storage:** Aqueous solutions of persulfate are more susceptible to decomposition than the solid product. The recommended materials of construction for storage and conveyance equipment (tanks, pipelines, etc.) are 304 and 316 stainless steel. Other acceptable materials include polyvinyl chloride, polyethylene, Plexiglas® plastic (or other suitable generic), Teflon® resin (or other suitable generic), chemical stoneware,

Containers and Packaging Evonik packages and ships crystalline persulfate chemicals in three different container types, according to customer requests.

Type	Construction	Persulfate wt/container	Containers per pallet	Persulfate wt/pallet
Bag	Polyethylene	55.1 lbs/25kg	40	2,204 lbs/1,000kg
Drum	Fiber drums, polyethylene liner	225 lbs/102kg	8	1,800 lbs/896kg
IBC*	Polypropylene sack	2,204 lbs/1,000kg	1	2,204 lbs/1,000kg

IBC = Intermediate Bulk Container, equipped with easy opening bottom spout for discharging into tanks or hoppers.*

and glass. Metals other than 304 and 316 stainless steel cause decomposition of the persulfate solutions or may be corroded by them. This is particularly true of Monel, copper, brass, and iron.

Do not store or process persulfate solutions in sealed or closed containers or vessels. Normal solution decomposition will release oxygen gas which may overpressurize a sealed container and cause rupture. Storage of persulfate solutions above 25°C will accelerate the rate of decomposition. See data on decomposition hazard and decomposition prevention.

Disposal

Persulfate crystals should never be discarded to trash bins. Contact with moisture, contaminants, and/or reducing agents can initiate a chemical reaction or a persulfate decomposition. Persulfate crystals which become a waste material are classified as hazardous waste because they are oxidizers. Persulfates that are spilled on the floor, or otherwise contaminated, are best dissolved in copious quantities of water.

A typically acceptable disposal method for spent persulfate solutions is to dilute with large quantities of water and dispose via a treatment system. Any disposal method must be in full accordance with all local, state and federal regulations.

Shipping

U.S. and international transportation regulations classify persulfates as OXIDIZERS and regulates their transport by air, water, and rail. These regulations detail the specific requirements for packaging, marking, labeling and describing persulfates for shipment.

Decomposition Hazard

Overheating or contamination of persulfates can lead to a runaway decomposition. The persulfate salt will begin to effervesce with an acid-like odor. Persulfates decompose to form solid sulfate salts and emit noxious fog or fumes of SOx and NOx. This decomposition may form a high temperature melt. The material will flow like magma and may ignite nearby combustible materials such as wood or paper. Oxygen produced by persulfate decomposition can increase the intensity of the fire.

The only way to halt a decomposition event is to apply **large** quantities of water to the reacting material. Eight pounds of water per pound of decomposing materials is recommended, but no less than two pounds of water per pound of persulfate should be applied. Insufficient amounts of water will intensify the reaction and increase the acid mist concentration. Please note that carbon dioxide (CO_2) or other gas-filled extinguishers will have **no** effect on decomposing persulfate. The use of water as an extinguishing agent is emphasized. Control of the melt and firefighting efforts are enhanced if persulfates are stored within containment areas.

Persulfate decomposition will require emergency responders wearing full protective rubber clothing, face and head protection, plus self-contained breathing apparatus (SCBA).

Decomposition Prevention

OBSERVE THE FOLLOWING PRECAUTIONS TO PREVENT DECOMPOSITION:

Do not expose persulfates or their containers to moisture. Moisture significantly lowers the decomposition temperature. Do not store persulfates near incompatible materials such as reducing agents, acids, bases, halide salt solutions, organics, ammoniacal solutions, alkaline cleansers, or other oxidizers. These materials can initiate decomposition. Do not store near point sources of heat such as steam pipes, electrical appliances, heating vents, gas flames, welding sparks, or radiant heaters. Do not store at ambient temperatures above 113°F or 45°C. Do not return spilled or unused portions of persulfates to the original container. Dirt, metal, moisture, or other contaminants can induce the decomposition of persulfates. Do not cross-contaminate with scoops, cups, or stirrers that may have been exposed to or used with other chemicals. Use only dedicated clean, dry plastic or stainless steel scoops and utensils for transfer. Do not grind or dry mix in equipment or machines that develop frictional heat.

CUSTOMER SUPPORT SERVICES

Quality Assurance

Evonik persulfate products are produced under an ISO-9002 certified quality system. Statistical Process Control (SPC) and a distributed control system combine to provide consistent process control. Evonik operators monitor key parameters to ensure consistent quality for all products.

All materials–raw, intermediate and final–are checked and tested in a new, modern laboratory employing the latest analytical technology. Quality test results are maintained on each batch of product. Certificates of Analysis and other end-product information can be customized to meet your system requirements.

Our production facility uses SPC methods to improve and assure the quality of persulfate chemical products. Evonik operators chart key operating parameters to maintain process control; this assures that quality is built in to each customer's order.

The SPC system is designed to meet your specific quality standards. Product is analyzed and identified as it leaves the packaging areas. Product quality is maintained by batch number. The information is then stored in a computer database, enabling Evonik to issue Certificates of Analysis that are specific to each batch of materials received by our customers.

Evonik uses cutting edge technology to ensure that our products are stable for storage or transport and use.
We have established new product safety standards for thermal stability to ensure a high-quality, stable persulfate.

Technical Services

Evonik customers have access to our experienced staff of chemists and engineers that can answer questions related to the safe handling, storage, or use of persulfates.
In fact, Evonik specialists have helped our customers pioneer many successful applications for persulfate chemicals. Our engineering services include the design and construction of storage facilities, or the safety inspection of your present warehouse or production facilities.
Evonik also offers a complete list of technical articles, bulletins, data sheets, and patents.

This information and all further technical advice are based on our present knowledge and experience. However, it implies no liability or other legal responsibility on our part, including with regard to existing third party intellectual property rights, especially patent rights. In particular, no warranty, whether express or implied, or guarantee of product properties in the legal sense is intended or implied. We reserve the right to make any changes according to technological progress or further developments. The customer is not released from the obligation to conduct careful inspection and testing of incoming goods.

Performance of the product described herein should be verified by testing, which should be carried out only by qualified experts in the sole responsibility of a customer. Reference to trade names used by other companies is neither a recommendation, nor does it imply that similar products could not be used.

EVONIK PHILIPPINES
10/F, Net Lima
5th Ave. Cor. 26th St.
Bonifacio Global City
Taguig, Metro Manila 1634
Philippines
Ph +63 2 669 2759

EVONIK MEXICO
Avenida Industrias No. 9
Col. Industrial Cerro Gordo
Ecatepec de Morelos
55420
+52 5 776-3933 3433 4050

EVONIK BRASIL
Rua Alvorada 1289 - Sala 310
VIla Olimpia, São Paulo/
SP - Brasil
CEP 04550-004
+55 11 3280 1610

EVONIK CORPORATION
2 Turner Place
Piscataway, NJ 08854
+1 732 981 5000

JUN23-auw

EVONIK INDUSTRIES AG
Active Oxygens
Rodenbacher Chaussee 4
63457 Hanau-Wolfgang
Germany
active.oxygens@evonik.com
evonik.com/activeoxygens