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MSDS: SODIUM POLYTUNGSTATE

Sodium Polytungstate is a new heavy liquid* for your float-sink process. It's an ideal substitute for the arcinogenic tetrabromethane.

FORMULA: $Na_6[H_2W_{12}O_{40}]$ OR $3Na_2WO_4 \bullet 9WO_3 \bullet H_2O$

APPEARANCE: white crystals or light yellow brown transparent solution

ADVANTAGES:

non-toxic agent

low viscosity at high concentration

density may be regulated with water from density 1, 1-3, 1g/cm3

laboratory centrifuges can be used

reusable

inflammable

no obnoxious smell

simple handling

can be used for the isopycnic density gradient centrifugation of minerals

PROPERTIES OF AQUEOUS SODIUM POLYTUNGSTATE SOLUTIONS:

The sodium polytungstate molecule is an aggregate of twelve monomeric units, with a molar mass of 1986 g/mol.

This substance is freely soluble in water, the resulting solutions exhibiting neutrality although the molecule is also stable over a wide pH range. At room temperature (25º C), the sodium polytungstate mass fraction of an aqueous saturated solution is 0.8 (see figure 1)

The compound also has a tendency to supersaturation, a property which is of importance when density is carried out with highly concentrated polytungstate solutions (important for the separation of minerals of differing densities). Figure 2 illustrates the viscosity of aqueous sodium solutions as a function of the density at 25º C.

The agent can have a density of up to 3.1 g/cm3 and has a low viscosity at high concentration. As can be derived from figure 2, the viscosity increases only insignificantly up to a density of about 2.5 g/cm3. According also separations in the fine grain range are possible within shorter periods.

In the case of a separation of water-insoluble solid mixtures of different densities, the densities of the solutions of the polytungstates can be increased up to 4.6 g/cm3 by adding to the solutions high density materials such as tungsten carbide of suitable grain size so as to form a suspension (see figure 3).

Please note the following:

a) Use only distilled or demineralized water.

b) after use of the solution keep the container well closed.

c) Use only glass, plastic or stainless steel containers.

d) If possible, do not contact with reducing agents. In those cases a blue color may occur however, it will have no influence on the density chosen. A few drops of hydrogen peroxide will remove or prevent the solution from turning blue.

e) The polytungstate solution can be recovered by washing respective particles with distilled or demineralized water and then evaporating to the desired density respectively solid polytungstate is added.

TOXICOLOGY:

According to the 1979 edition of the comprehensive Handbook on the Toxicology of Metals (see: Handbook on the Toxicology of Metals, edition by L. Friberg et al., Elsevier/ North Holland Biomedical Press, 1979) tungsten compounds are considered non-toxic, whereas the halogenated lower alkanes, in particular tetrabromethane, are known to be cancerogenous.

The LD50 of soluble tungsten compounds (Disodium tungstate) in rats is relatively high (rat, oral LD 50: 1190 mg/kg body weight, see: "METAL TOXICITY IN MAMMELS" Chemical Toxicity of Metals and Metalloids, B. Venogopal and T.D. Luckey, Department of Biochemistry, University of Missouri, Columbia (1978)). Nevertheless, do not incorporate sodium polytungstate, as it is harmful if swallowed.

INDENTIFICATION OF THE SUBSTANCE/ PREPARATION:

Sodium metatungstate
Sodium polytungstate

COMPOSITION/INFORMATION ON INGREDIENTS:

Sodium metatungstate

CAS No.: 12141-67-2

Hazard symbol: Xn

R-phrases: 22-41-52/53

HAZARD IDENTIFICATION:

Harmful if swallowed. Risk of serious damage to eyes.

Harmful to aquatic organisms.

May cause long-term adverse effects in the aquatic environment.

FIRST-AID MEASURES:

After inhalation take the patient into fresh air. Symptomatic treatment.

After contact with skin, wash immediately with plenty of water.

After contact with eyes, rinse eyes with water for at least 15 minutes, keeping the lids open. Consult a doctor.

In case of swallowing drink plenty of water. Induce vomiting. Symptomatic treatment. Consult a doctor.

FIRE-FIGHTING MEASURES:

Extinquishing media: No restriction in fire situations.

ACCIDENTAL RELEASE MEASURES:

Use the personal protective equipment listed in Number 8.
Do not empty into drains or waters.
Moisten the substance before taking up or take up with inert and moist material.
Take up spilled product. Fill into labeled, sealable containers.

HANDLING & STORAGE: Put on protective equipment.
Recommended: Use filling and siphoning units which can be sealed dust-tight.
Store only in sealed original or similar containers at room temperatures. Avoid deposition of dust

EXPOSURE CONTROLS/ PERSONAL PROTECTION:

Respiratory protection: particle filter, e.g. DIN 3181 - P 2
Hand protection: gloves
Eye protection: tightly fitting protective goggles (acid protection goggles).
Body protection: Wear protective clothing.

PHYSICAL AND CHEMICAL PROPERTIES:

Form: crystalline powder
Color: white to grey
Odor: lachrymatory
pH value: approx. 3 at 4000 g/l water at 20 °C
Melting point: decomposition
Boiling point: not applicable (do not boil)
Flash point: not applicable
Ignition temperature: not applicable
Explosive limits: not applicable
Vapor pressure: not relevant
Density: approx. 5,47 g/cm³ at 20 °C
Bulk density: approx. 1570 kg/m³
Solubility in water: >1000 g/l at 20 °C
Solubility in fat: <0,7 mg/100 g fat at 37 °C
Log POW: < - 5,2 at 20 °C
Viscosity: not applicable

STABILITY AND REACTIVITY:

Hazardous reactions: none known
Decomposition products: No hazardous decomposition products observed.

TOXICOLOGICAL INFORMATION:

Acute toxicity: LD_{50} oral, rat: 1715 mg/kg

LD_{50} dermal, rat: more than 2000 mg/kg

Irritation of the skin/rabbit (exposure 4 h): No skin irritation.

Irritation of the eyes/rabbit: irritant, risk of serious damage to eyes

(method: directive 84/449/ EEC, B.5).

Sensitization test according to Magnusson/Kligmann (maximizing test): In the guinea-pig the product has no skin sensitizing effect.

Subacute toxicity:

Species: Wistar rats; feeding period: 28 days

Result: No effect seen at doses up to 50 mg/kg (Noel)

Salmonella/microsome test (Ames test): Not mutagenic response in the Ames-Test. Micronucleus test: No indication of mutagenic effects.

ECOLOGICAL INFORMATION:

Acute fish toxicity: LC_{50}=420 mg/1

Tested on carp (Cyprinus carpio); duration of test=24 h

Acute toxicity for daphnia: EC_{50}=83 mg/1

Tested on Daphnia magna; duration of text=48 h

Water pollution class (WGK): 1—slightly hazardous to water (own classification)

WGK=Classification in accordance with the German Water Resources Act Unused material: reuse if possible.

DISPOSAL CONSIDERATIONS:

Unused material: reuse if possible. May be disposed of on approved landfills after chemical/physical conditioning.

Waste code number: 51540

TRANSPORT INFORMATION:

GGV See/IMDG Code:-- UN No. : -- MFAG: -- EmS:--

PG: -- MPO: NO

GGVE/GGVS: Class -- No. -- RID/ADR: Class -- No. --

Warning sign: Hazard no. - --- Substance no. ----

ADNR: Class -- No. -- Cat -- ICAO/IATA-DGR: --

Declaration for land shipment: --

Declaration for sea shipment: --

Declaration for shipment by air: --

Other information: Not dangerous cargo. Keep separated from foodstuffs.

REGULATORY INFORMATION:

Labeling in accordance with directive 79/831/EEC (definition principle) and its amendments and adaptations:

Symbol: Xn, hazard description : harmful sodium metatungstate

R 22: Harmful if swallowed.

R 41: Risk of serious damage to eyes.

R 52: Harmful to aquatic organisms.

R 53: May cause long-term adverse effects in the aquatic environment.

S 22: Do not breathe dust.

S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 39: Wear eye/face protection.

S 61: Avoid release to the environment. Refer to special instructions/Safety data sheets.

OTHER INFORMATION: The data given here is based on current knowledge and experience. The purpose of this Safety Data Sheet is to describe the products in terms of their safety requirements. The data does not signify any warranty with regard to the products' properties.

VISCOSITY: Density approx. 2.45 g/cm^3, approx. 8 mPa.s *

Density approx. 2.89 g/cm^3, approx. 26 mPa.s **

*1 mPA is the viscosity of pure water. Therefore 8 mPa.s means that S/P is 8 times higher than pure water.

** The viscosity of the S/P at this density means that S/P is 26 times higher than the viscosity of pure water.

POLY-GEE BRAND SODIUM POLYTUNGSTATE:

The mixing of powder material:

Combine the POLY-GEE Brand Sodium Polytungstate powder and very pure distilled water in a pyrex beaker. Heat the water and powder combined, to more than 20ºC to dissolve the powder. Heat slowly so as not to burn the POLY-GEE material. Using the guidelines below for dilution, there might be a bit of variance in the density. If there is a variance, either boil off a bit of water (to increase the density), or add water (to decrease the density). The liquid will remain in liquid form. Keep in a plastic container. A bit of material may settle out over time. You need not be concerned about this.

For a Density of 2.45. Amounts of POLY-GEE material and distilled water:

1lb. Poly-Gee (454 grams)	+ 160 grams of water	= Density approx. 2.45 g/cm3
5 lbs. Poly-Gee (2270 grams)	+ 800 grams of water	= Density approx. 2.45 g/cm3
10 lbs. Poly-Gee (4540 grams)	+ 1600 grams of water	= Density approx. 2.45 g/cm3

For a Density of 2.89. Amounts of POLY-GEE material and distilled water:

1 lb. Poly-Gee (454 grams)	+ 101 grams of water	= Density approx. 2.89 g/cm3
5 lbs. Poly-Gee (2270 grams)	+ 505 grams of water	= Density approx. 2.89 g/cm3
10 lbs. Poly-Gee (4540 grams)	+ 1010 grams of water	= Density approx. 2.89 g/cm3

Do not boil the S/P Solution, maximum temperature is 158° F (70°C)

DIRECTIONS FOR USE:

HOW DO I WORK WITH SODIUM POLYTUNGSTATE?

a) Use only distilled or demineralized water.
b) Use only glass, plastic or stainless steel containers.
c) Always add solutions in portions to water, not vice versa, in order to expedite formation of solution.
d) Do not allow the solution to come in contact with reducing agents.
e) The samples to be separated should be free of soluble calcium ions.
f) Laboratory centrifuges should be used for very rapid separations in the higher density range.
g) Avoid evaporation of the solution to dryness, since it takes many hours to redissolve the concrete-like solid formed which cannot be removed mechanically from glass containers.

RECOVERY OF SODIUM POLYTUNGSTATE
The polytungstate solution can be recovered by washing respective particles with distilled or demineralized water and then evaporating to the desired density respectively solid polytungstate is added.

1. THE VISCOSITY INCREASES RAPIDLY IN THE HIGH DENSITY RANGE
   Whenever possible, use a centrifuge (not a separatory funnel) for your work, since it shortens very substantially the separation process and in overcoming problems caused by viscosity in high concentration ranges.

2. THE SAMPLES TO BE PROCESSED CONTAIN SOLUBLE CALCIUM IONS
   The sample material to be separated should be free of soluble calcium ions. Otherwise, insoluble calcium polytungstate is formed. A respective example are clay-type minerals. If in doubt, wash sample thoroughly in hot water. If experiments show that there is still a reaction, simply use a minor amount of ethylenediamine tetraacetic acid, the common water softening agent. This complex is water soluble.

3. IF THE SOLUTION SUDDENLY TURNS BLUE
   The solution has come into contact with reducing agents. This, however, does not influence the selected density. If the color is not to dark let the solution stand for a few days under admission of air or add a few droplets of hydrogen peroxide. The solution then returns to its original color or slightly yellow.

4. IF YOU WORK WITH SULFIDES, ETC.
   These could act as reducing agents. Wash the samples before separation with hot water or decompose the same with a diluted mineral acid.
   - Depending on whether the specified SPT you work with has 2, 12 or 24 H2O bonded as crystal water, there may be slight variations.
   - Example: A solution with a density of 2.94 g/cm3 at 20ºC is obtained by an 84 mass % solution (e.g. 840g solid and 160g water).

5. PROCEDURE FOR RECYCLING SODIUM POLYTUNGSTATE
   a) Pour Na Polytungstate through a 55mm glass microfibre filter (Whatman Cat. No. 1820 055)
   b) Discard the filters (use many to filter a 2-liter solution)
   c) Pour the filtrate into plastic pans, and place in oven at 50C. After 2–3 days, the liquid has evaporated, leaving a solid.
   d) Grind solid, recycled Na Polytungstate using a mortar and pestle.

SODIUM POLYTUNGSTATE GENERAL INFORMATION:

Should you encounter difficulties or make observations not mentioned on these pages, we would appreciate your respective information so that we will be able to assist you.

WHY SODIUM POLYTUNGSTATE?
Because it is superior to known and so far used heavy liquids

a) It is non-toxic
b) It is safe in respect to ecology and simple to handle
c) It is easy to recover almost fully
We have developed this product for you- and worldwide many of your colleagues avail themselves of sodium polytungstate for mineral separations and for the density gradient centrifugation. Earthquake researchers also use the product.
It is by no means difficult to switch from a familiar but health damaging chemical like TBE
to a non-toxic product, which additionally offers many advantages.

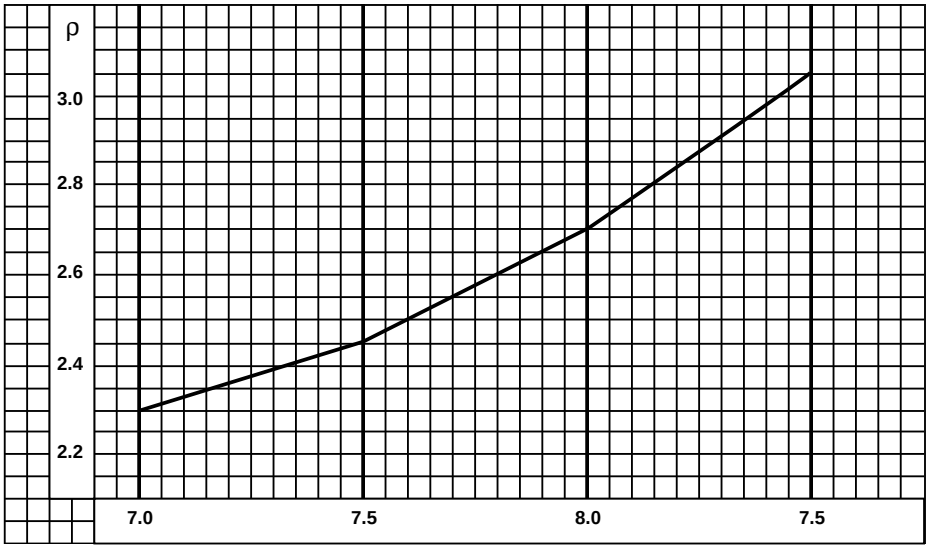
CHEMICAL DESCRIPTION
Sodium Polytungstate (SPT) is the generic name for the compound here involved: Sodium metatungstate Ns6(H_2 W_{12} O_{40}), which is a spherical molecule having 40 oxygen atoms in its outer shell, 12 tungsten atoms in tetrahedrsl configuration in an inner shell and 2 hydrogen atoms in the center, all surrounded by 6 sodium cations.
The analytic data are: WO_3 = 86.66%; Na 4.50%; H_2O= 8.84%.

TRACE ELEMENTS
As< 5 ppm; Bi< 2 ppm; Co< 1 ppm; Cu< 1 ppm; Fe< 1 ppm; Mn< 1 ppm;
Mo< 2 ppm; Nb= 6 ppm; Ni< 1 ppm; P= 8 ppm; Pb< 1 ppm; Sb= 2 ppm;
Si= 17 ppm; Sn= 7 ppm; Sr< 1 ppm; Ta< 1 ppm; Ta< 1 ppm; U< 10 ppm.

In view of the high water solubility of SPT, these trace elements can be totally removed from the separated goods by a few washings with a little water.

*US Pat. 4,557,718

DENSITY VERSES CONCENTRATION AT 20°C



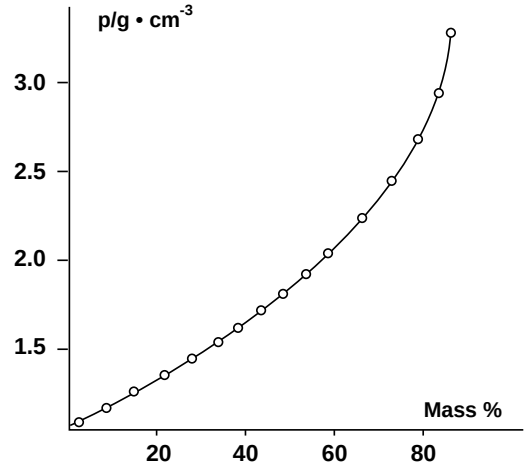


Figure 1:
The density of aqueous sodium polytungstate solution as a function of the mass portion at 25ºC.

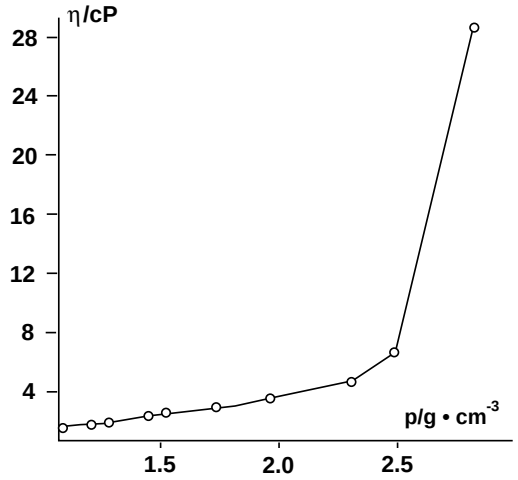


Figure 2:
The viscosity of aqueous sodium polytungstate solutions as a function of density at 25ºC.

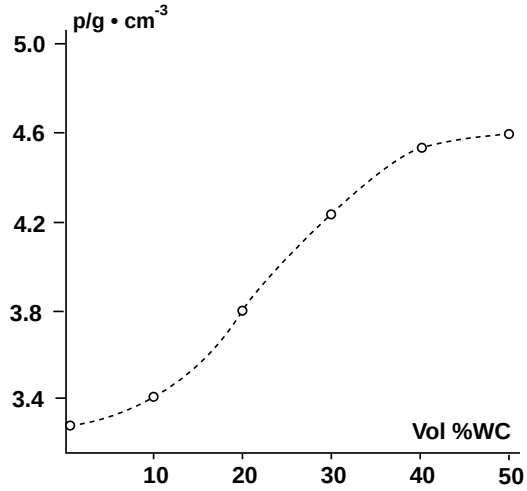


Figure 3:
The viscosity of a heterogenous mixture of aqueous sodium polytungstate solutions and tungsten carbide as a function of the solid material volume portion starting from a saturated aqueous sodium polytungstate solution.