TC-TUNGSTEN COMPOUNDS

environment-friendly heavy liquid

Sodium metatungstate / Sodium polytungstate *

The ever-increasing awareness in the chemicals industry of the importance of environmental issues has resulted in an overall steady increase in the use of sodium polytungstate over recent years. We are absolutely sure that sodium polytungstate will completely replace the highly toxic, carcinogenic, chlorinated brominate hydrocarbons in the field of sink/swim analysis in future.

Sodium polytungstate – also known as sodium metatungstate – belongs to the group of so-called "non-phase-in" substances, which means that was sodium polytungstate has already been registered under the requirements of the German Law on Chemical Substances and in accordance with the EC Directive 67/548/EC.

Sodium polytungstate has therefore been subjected to all the necessary statutory test procedures, a summary of the certificates for which is contained under the ELINGS No. 412-770-9.

Sodium polytungstate has automatically been allocated a registration number under the EU's REACH regulations and is therefore deemed to have satisfied the necessary registration requirements.

Sodium polytungstate has already been tested using all the currently available methods for toxicity and eco-toxicity. The present state of knowledge about the effects of sodium polytungstate on humans, animals and the environment is sufficiently high for us to be able exclude the possibility of any risks to health arising from the proper use of this new type of heavy liquid.

This extensive series of tests has also demonstrated that sodium polytungstate may be classified as being non-toxic, which means that the use of the use of aqueous sodium polytungstate solution is set to increase even further across the whole world.

Furthermore, we should like to point out that another important benefit of aqueous sodium polytungstate is the fact that it may be reused. We will collect free of charge and for reuse any used sodium polytungstate solutions which are no longer required by customers, even if they have been diluted or contaminated.

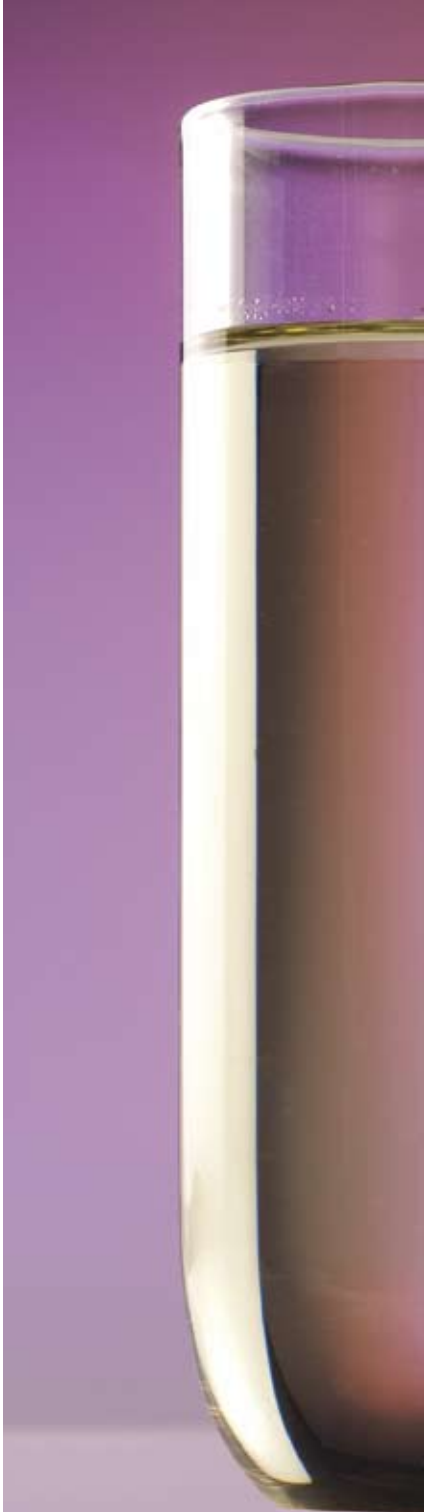
On the following pages we shall describe the most important properties of sodium polytungstate and its aqueous solutions. We should also like to draw your attention to some interesting publications which describe its possible uses.

Sedimentation of gold leaf
in an aqueous sodium
polytungstate-solution
with a density of 3,0 g/cm3

Sodium polytungstate

SODIUM POLYTUNGSTATE is a compound, which has been successfully used in the manufacture of heavy liquids for a relatively short period. It has significant advantages when compared to the use of zinc chloride solution or the highly toxic halogenated carbons for sink/swim analysis.

Formula	$Na_6[H_2W_{12}O_{40}]$ or $3Na_2WO_4 \cdot 9WO_3 \cdot H_2O$
Appearance	White crystals or light yellow-green transparent solution
Properties	Very easily soluble in water, pH-neutral solution, maximum possible density of solution: 3,1 g/cm^3 at 25° C
Features	Non-toxic Non-flammable Odourless Reusable Density may be adjusted by dilution from ρ = 1,1 - 3,1 g/cm^3 Low viscosity Easy-to-use Sinks and floats may be easily cleaned with water after use Environmentally friendly
Application	The heavy liquid solution is prepared by dissolving sodium polytungstate in de-ionized water. Te resulting compound is a salt which is easily soluble in water. The maximum attainable density of the solution in water at room temperature is 3.1 g/cm^3. Further chemical properties of the solution may be ascertained by studying the diagrams. These show density as a function of the sodium polytungstate content (Fig. 1) and viscosity as a function of density (Fig. 2). As may be seen from Fig. 2, viscosity increases only slightly with densities up to 2.5 g/cm^3. This process also allows the fine granules to be separated. The use of a laboratory centrifuge will speed up the separation process.



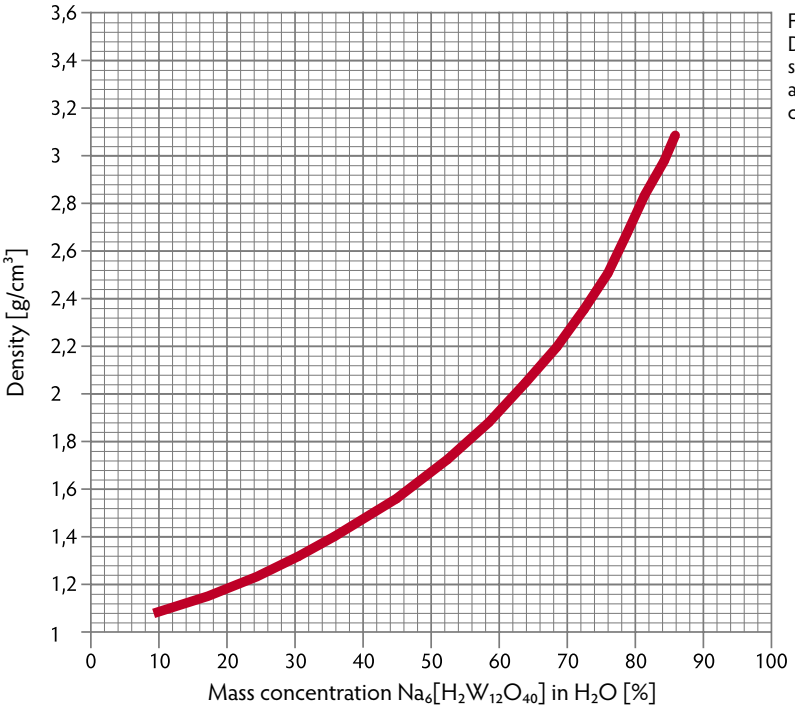


Fig. 1:
Density of aqueous sodium polytungstate as a function of mass concentration

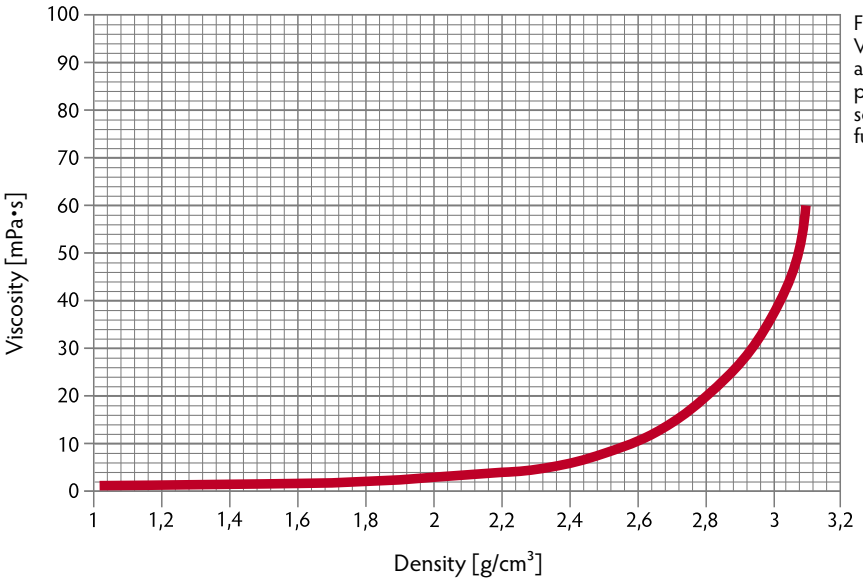


Fig. . 2:
Viscosity of aqueous sodium polytungstate solutions as a function of density

Sodium polytungstate

Structur

This is a 12-fold aggregated isopolytungstate with a molar mass of 2986.12 g/Mol.
The structure of polytungstate is modelled using octahedrons in which the oxygen ions are located in the corners and the tungsten ions in the middle of the octahedrons. When represented as a spherical model, the oxygen ions form a dense spherical shell while the tungstate ions fill the open spaces in the octahedra.
Because of this structure this substance may be considered a "true" metatungstate, represented structurally as $Na_6[H_2W_{12}O_{40}]$. It is known that in "true" metatungstates both of the oxygen ions are located in the central empty space of the polyanion and that they are unable to penetrate the external shell of the spherical casing.
Solid crystalline sodium polytungstate is not hygroscopic and may be stored for an unlimited period at room temperature.

Notes

The following points should be observed when using aqueous polytungstate solutions:

a) Only distilled or de-ionized water should be used.
b) All containers must be sealed properly after use.
c) Only containers made from glass, synthetic materials or stainless steel should be used
d) Do not bring the solution into contact with reduced substances.
   The resultant blue colouring will not, however, affect the achievement of the required density in any way. Colour may be removed from the solution and a blue colouration prevented by the addition of a few drops of hydrogen peroxide.
e) The Sinks and floats used should not contain any water soluble ions.
   Pb^{2+}-, Ag^{+}-, Sn^{2+}- and Ba^{2+} - ions in particular form deposits which are difficult to dissolve. If these ions should be present in the samples these must be washed with hot water prior to the – sink/swim analysis.

Analysis

Solid sodium polytungstate contains at least 86 % ± 1 % WO_3.
The quantity of bound water in sodium polytungstate may vary slightly. Typical analysis values (not guaranteed values) are: Al ≤ 0.0015 %; As ≤ 0.012 %; Cu ≤ 0.001 %; Fe ≤ 0.005 %; Mo ≤ 0.005 %; Si ≤ 0.005 %; Ti ≤ 0.001 %.

Form of supply

A standard delivery of sodium polytungstate will be of a ready-to-use aqueous solution with a density of 2.82 ± 0.02 g/cm^3 or with densities of ≥ 3.0 g/cm^3 in 1 kg, 5 kg, 10 kg and 25 kg. Sodium polytungstate may also, however, be supplied in crystalline form or as granules batches in batches of 1 kg, 5 kg, 10 kg and 25 kg.

Left: Sodium polytungstate granulate
Right: Sodium polytungstate powder
(Image greatly magnified)

Toxicology

In general, tungsten compounds are classified as being non-toxic (c.f. "Metal Toxicity in Mammals – 2", Chemical Toxicity of Metals and Matalloids by B. Venugopal and T. D. Luckey, Department of Biochemistry, University of Missouri, Columbia 1978 and Handbook on the Toxicology of Metals, Chapter 39, By L. Fridberg, G. F. Nordberg and V. B. Vouk, Elsevier/ North Holland Biomedical Press (1979)).
In addition, there is a complete list of toxic heavy metals in the Manual of Pharmacology, Lehrbuch der Pharmakologie by Bader, and this list does not include tungsten.
Sodium polytungstate / Sodium metatungstate was classified as being a new substance for the purposes of the new German Law on the use of Chemicals (Chemikaliengesetz (ChemG)) and has been fully tested in accordance with the relevant legal requirements (in relation to notification and registration obligations and evidence of testing in accordance with the Statutory Ordinance on the Evidence of Testing of Chemical Substances Prüfnachweisverordnung - ChemPrüfV).
The following toxicity test values have been ascertained for sodium polytungstate :
LD_{50} oral, Rat = 1715 mg/kg; LD_{50} dermal, Rat = > 2000 mg/kg.
Sodium polytungstate is therefore classified as being non-toxic for the purposes of the German Chemicals Law. Sodium polytungstate does not irritate the skin or cause sensitization.
It should be kept well away from the eyes.

Further Details can be gathered from the safety data sheet.

Disposal

Used, discarded, diluted or contaminated samples of aqueous sodium polytungstate solution will be collected by us free of charge. We are then able to recover the remaining tungsten from the solution using a specialised process.

*) former patent by TC-Tungsten Compounds, Dr. Rainer Kamps

Our Products

SPT 0 Crystalline sodium polytungstate, particularly low in carbon and nitrogen

SPT 1 Sodium polytungstate in powder form

SPT 2 Sodium polytungstate granulate (Lower dust component)

SPT 3 Sodium polytungstate, ready-to-use liquid, available with various fluid densities up 3.0 g/cm^3 (Standard fluid density 2.82 g/cm^3 ∓ 0.02 g/cm^3)

SPT 4 Sodium polytungstate / tungsten carbide suspension with densities of 3.2 g/cm^3 to 4.4 g/cm^3

SPT 5 Sodium polytungstate, ready-to–use liquid, available in various fluid densities up to 3.0 g/cm^3 (Standard fluid density: 2.82 g/cm^3 ∓ 0.02 g/cm^3) Highly stabilised for use with metallic samples.

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