ProductInformation

SODIUM ORTHOVANADATE
Sigma Prod. No. S6508

CAS NUMBER: 13721-39-6
SYNONYM: sodium vanadate, sodium vanadium oxide

PHYSICAL DESCRIPTION:

Appearance: white powder, sometimes with faint yellow cast
Molecular formula: Na_3VO_4
Formula weight: 183.9
Melting range: 850-866°C[1]

STORAGE / STABILITY AS SUPPLIED:

Sodium orthovanadate is stable for years at room temperature.

SOLUBILITY / SOLUTION STABILITY:

The product gives a slightly hazy solution in water at 50 mg/mL (270 mM) even if sonicated.

Stock solutions of sodium orthovanadate may be prepared at 1 mM (or higher, as desired) in water adjusted to approximately pH 10. To ensure the presence of monomers the solution is heated to boiling until translucent and the pH readjusted to 10. This stock was reported stable stored in flint glass at room temperature, retaining full stability for several months. Solutions can also be divided into aliquots, stored in plastic and frozen. "Remember that added vanadyl, metavanadate, orthovanadate or decavanadate will interconvert in aqueous solution without suitable precautions (i.e., pH, oxidation state, complexing compounds and concentration". The precise concentration at pH 10.5 of a dilute aqueous solution may be determined from the molar extinction coefficient of 3,550 at 260 nm. The orange color observed before boiling is due to decavanadate. At pH 10 this will slowly depolymerize over several hours to the colorless monovanadate. The process can be accelerated by boiling at pH 10, as described above.[2]

USAGE:

Vanadate inhibits a number of ATPases and phosphate-transferring enzymes, most likely by acting as a phosphate analogue.[3,10] At the concentration required for maximum inhibition, vanadate may have side effects that limit its application in cell culture.[3]

USAGE: (continued)

It has recently been shown to down-regulate cell surface insulin and growth hormone receptors and to inhibit their degradation in cultured human lymphocytes.[4]

Vanadate (10 mM) is also a strong inhibitor of lysosomal proteolysis in hepatocytes, the effect being ascribed to a direct inhibition of lysosomal enzymes.[5]

Used as an inhibitor of

- protein-phosphotyrosine phosphatase.[2]
- ATPase (50% inhibition by 0.5 to 1 μM vanadate); the motility of embryo cilia and sperm flagella (motility completely inhibited by 0.5 μm and 4 μM, respectively).[6]
- protein tyrosine phosphatases.[7,8]
- alkaline and acid phosphatases.[9] Alkaline phosphatase from human liver, intestine or kidney was inhibited (K_i < 1 μM), although inhibition was reversed and full activity was restored in the presence of 1 mM adrenaline.[10]
- aryl sulfatase (K_i = 6 μm).[11]

Vanadate was used to stimulate pp60 (v-src) kinase activity in intact cells.[12] It also stimulated amino acid transport activity in skeletal muscle, in a rapid and concentration-dependent manner.[13]

REFERENCES:

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