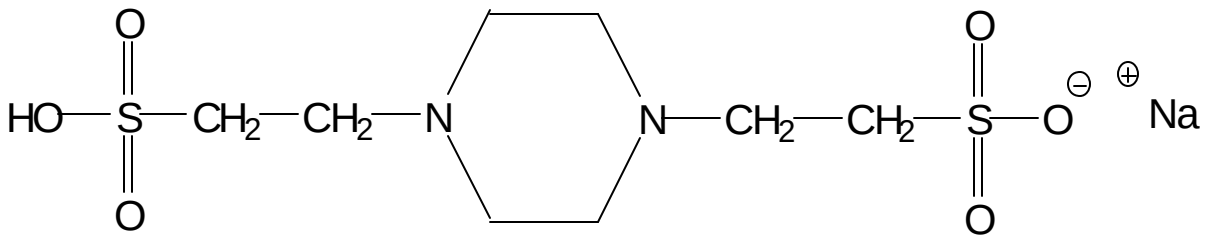
3050 Spruce Street
Saint Louis, Missouri 63103 USA
Telephone 800-325-5832 • (314) 771-5765
Fax (314) 286-7828
email: techserv@sial.com
sigma-aldrich.com

ProductInformation

PIPES MONOSODIUM SALT
Sigma Prod. No. P2949



CAS NUMBER: 10010-67-0
SYNONYMS: piperazine-N,N'-bis(ethanesulfonic acid) monosodium salt; 1,4-piperazinediethanesulfonic acid monosodium salt

PHYSICAL DESCRIPTION:

Appearance: white powder
Molecular formula: $C_8H_{17}N_2O_6S_2Na$
Molecular weight: 324.3
(pK_{a1} <3, but not usually reported)[1]; pK_{a2} = 6.8 at 25°C[1,2]
Effective buffering range: 6.1 - 7.5 (at 25°C)
$\Delta pK/\Delta T$ = - 0.0085[3]
No reported metal binding[1]

STORAGE / STABILITY AS SUPPLIED:

PIPES monosodium salt is expected to be stable for years at room temperature.

SOLUBILITY / STABILITY OF SOLUTIONS:

PIPES itself is not very soluble in water (only 1 g per L at 100°C)[1], but its salts are very soluble in water at the pH normally used as a buffer. PIPES monosodium gives a clear, colorless solution at 0.05 M in water (the resulting solution has a pH of approximately 4.5-4.7). However, 10 g will dissolve in 40 mL of 0.1 N NaOH.[2]

If solutions are to be sterilized, filtration is generally recommended for ethanesulfonic acid buffers, but PIPES buffers have been successfully autoclaved.[2]

PIPES MONOSODIUM SALT
Sigma Prod. No. P2949

GENERAL USAGE:

PIPES is a member of the ethanesulfonic acid buffer series, first introduced by Good et al., developed to meet certain criteria: midrange pK_a, maximum water solubility and minimum solubility in all other solvents, minimal salt effects, minimal change in pK_a with temperature, chemically and enzymatically stable, minimal absorption in visible or UV spectral range and easily synthesized.[1] Since its pK_a at 37°C is near physiological pH, it has applications in cell culture work. Sigma offers a Biotechnology Performance Certified Product (P1851), as well as several different salts for convenience in buffer preparation.

Buffers can be prepared by adding a solution of base to PIPES free acid, titrating to the appropriate pH, or by mixing equimolar solutions of the monosodium salt and the disodium salt, titrating to the appropriate pH.

Several application notes:
Glutaraldehyde fixation of plant and animal tissue samples can cause loss of lipid, leading to apparent morphological changes. Lipid loss and artifacts are minimized when PIPES was used to buffer the glutaraldehyde fixative.[4,5]

Alkaline phosphatase activity is lost selectively from certain rat hepatocyte organelles when fixed for ultracytochemistry with cacodylate-buffered glutaraldehyde. When PIPES was used as buffer, retention of activity was 60% greater.[6]

Fixation of fungal zoospores for fluorescence microscopy and electron microscopy was optimal with a combination of glutaraldehyde and formaldehyde in PIPES buffer.[7]

REFERENCES:

1. Good, N.E., et al., *Biochemistry*, 5, 456-477 (1966).
2. Sigma quality control.
3. *Methods in Enzymology*, 104, 404 (1984).
4. Salema, R. and Brandao, I., *J. Submicr. Cytol*., 9, 79 (1973).
5. Schiff, R.I. and Gennaro, J.F., *Scanning Electron Microsc*., 3, 449 (1979).
6. Yamamoto, K. and Ogawa, K., *Histochemistry*, 77, 339 (1983).
7. Hardham, A.R., *J. Histochem. Cytochem.*, 33, 110 (1985).