



SIGMA-ALDRICH

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

Product Information

Glutaraldehyde 25% solution

Product Number **G5882**

Storage Temperature -0 °C

Product Description

Molecular Formula: $C_6H_8O_2$

Molecular Weight: 100.1 (anhydrous product)

CAS Number: 111-30-8

Melting Point: -6 °C (25% Solution)

Boiling Point: 101 °C (25% Solution)

Density: 1.06 g/ml (25% solution at 20 °C)

Glutaraldehyde is also referred to as glutaral, 1,5-pentanedione, potentiated acid glutaraldehyde, sonacide, and glutardialdehyde. This product is supplied as a 25% (w/w) solution in water.

Pure monomeric glutaraldehyde has an absorbance peak at 280 nm and the main impurity, possibly a polymer, has an absorbance peak at 235 nm.¹ Upon analysis, this product is 25-28% by titration and has an A_{235}/A_{280} ratio of not more than 0.5. Monomeric glutaraldehyde may be purified from polymeric glutaraldehyde by treatment with charcoal (5% w/v) and subsequent filtration (3-4 times).² Untreated glutaraldehyde has an absorption at 235 nm that is 5 times greater than that at 280 nm, whereas, after three washings the values are about equal. Glutaraldehyde is a bifunctional cross-linking reagent, reacting with NH_2 groups to form Schiff's bases.³

Commercial 25% aqueous solutions at approximately pH 3 contain 3% glutaraldehyde, the hemiacetal and polymers of the latter. At neutral or slightly alkaline pH, other polymers form, the length increasing with pH, until a precipitating complex forms.³

Glutaraldehyde is a disinfectant, which is rapidly effective against vegetative forms of Gram-positive and Gram-negative bacteria. It is also effective against acid-fast bacteria, bacterial spores, some fungi and viruses, including hepatitis B virus and human immunodeficiency virus.^{4,5}

2% aqueous solutions are efficient as bacteriocidal and sporicidal agents within 15-30 minutes.⁶ However, other references indicate two to three hours of exposure to the 2% solution were required to kill

B. subtilis, *C. tetani* or *C. perfringens* (examples of sporicidal activity).⁷ Other extensive information about usage for sterilization can be found in the above reference. The authors also indicate that a 1-2% glycine solution can be used as an inactivator of glutaraldehyde, since glycine is effective and generally nontoxic.

This product has been specially purified for use as an electron microscopy fixative or for other sophisticated uses, such as cell fixation.^{8,9,10,11} For fixing tissue for electron microscopy, the concentration of glutaraldehyde should be 1.5%. Any of the Grade I aqueous glutaraldehyde solutions can be used, but they need to be diluted with buffer down to a 1.5% final concentration.¹² An example of one buffer composition is: 1% formaldehyde, 1.5% glutaraldehyde, 0.1% magnesium chloride, and 0.05% calcium chloride (final concentrations; pH will vary depending on the tissue being fixed).

This product can also be used for stabilization of proteins on agarose beads,¹³ activation of polystyrene and glass for immobilization of antibodies and antigens,¹⁴ and coupling peptides onto carrier proteins.¹⁵ Additional references for use as a cross-linking agent are available.^{15,16,17,18,19,20}

Precautions and Disclaimer

For Laboratory Use Only. Not for drug, household or other uses.

Storage/Stability

Purified samples of 25% glutaraldehyde stored at -20 °C showed virtually no change in their UV absorbance characteristics even after 8 months.¹ However, solutions are very heat sensitive.

References

1. Gillett, R., and Gull, K., Glutaraldehyde—Its Purity and Stability. *Histochemie*, **30**, 162-167 (1972).
2. Painless Particles, **5**, 3 (1992).
3. Data for Biochemical Research, 3rd ed., Dawson, R. M. C., et al., Oxford University Press (New York, NY: 1986), p. 391.

4. Martindale The Extra Pharmacopoeia, 29th ed., Reynolds, J. E. F., ed., The Pharmaceutical Press (London, England: 1989), p. 963.
5. Ross, P. W., A New Disinfectant, *J. Clin. Pathol.*, **19**, 318-320 (1966).
6. Rubbo, S. D., Biocidal Activities of Glutaraldehyde and Related Compounds, *J. Appl. Bacteriol.*, **30**, 78-87 (1967).
7. Disinfection, Sterilization and Preservation, 4th ed., Block, S., p. 596-614.
8. Avrameas, S., Immunoenzymic Techniques for Biomedical Analysis *Meth. Enzymol.*, **44**, 713 (1976).
9. Kuhlmann, W. D., et al., A Comparative Study for Ultrastructural Localization of Intracellular Immunoglobulins Using Peroxidase Conjugates *J. Immunol. Methods*, **5**, 33-48 (1974).
10. Chambers, R. W., et al., Glutaraldehyde Fixation in Routine Histopathology *Arch. Pathol.*, **85**, 18-30 (1968).
11. Antibodies: A Laboratory Manual, p. 386.
12. Procedures in Electron Microscopy, Robards, A. W. and Wilson, A. J., (1993).
13. Kowal, R. and Parsons, R. G., Stabilization of Proteins Immobilized on Sepharose from Leakage by Glutaraldehyde Crosslinking *Anal. Biochem.*, **102**, 72-76 (1980).
14. Wood, W. G., and Gadow, A. J., Immobilisation of Antibodies and Antigens on Macro Solid Phases--a Comparison Between Adsorptive and Covalent Binding. A Critical Study of Macro Solid Phases for Use in Immunoassay Systems. Part I. *Clin. Chem. Clin. Biochem.*, **21**, 789-797 (1983).
15. Protein Structure: A Practical Approach, Creighton, T. E., ed., IRL Press (Oxford, England: 1989), p. 96.
16. Darawshe, S., and Daniel, E., Molecular Symmetry and Arrangement of Subunits in Extracellular Hemoglobin from the Nematode *Ascaris suum*. *Eur. J. Biochem.*, **201(1)**, 169-173 (1991).
17. Korn, A. H., et al., Glutaraldehyde: Nature of the Reagent. *J. Mol. Biol.*, **65**, 525-529 (1972).
18. Ramasamy, I., and Butterworth, P. J., *Biochim. Biophys. Acta.*, **370**, 477-486 (1974).
19. Peters, K., and Richards, F. M., Chemical Cross-linking: Reagents and Problems in Studies of Membrane Structure. *Annu. Rev. Biochem.*, **46**, 523-551 (1977).
20. Avrameas, S., Coupling of Enzymes to Proteins with Glutaraldehyde. Use of the Conjugates for the Detection of Antigens and Antibodies. *Immunochemistry*, **6**, 43-52 (1969).

CMH/RXR 5/06

Sigma brand products are sold through Sigma-Aldrich, Inc.

Sigma-Aldrich, Inc. warrants that its products conform to the information contained in this and other Sigma-Aldrich publications. Purchaser must determine the suitability of the product(s) for their particular use. Additional terms and conditions may apply. Please see reverse side of the invoice or packing slip.