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ProductInformation

Dimethyl sulfoxide
Cell Culture Tested

Product Number **D 2650**
Store at Room Temperature

Product Description

Molecular Formula: C_2H_6OS
Molecular Weight: 78.13
CAS Number: 67-68-5
Melting Point: 18.45 °C
Boiling Point: 189 °C
Density: 1.1 g/ml
Dielectric Constant: 45
Viscosity: 1.1 centipoises (27 °C)
Synonyms: DMSO, methyl sulfoxide, dimethyl sulphoxide

This product is a Hybri-Max™ product. It is hybridoma tested and is assessed for suitability in cell freezing. This product is sterile filtered and tested for endotoxin levels.

Dimethyl sulfoxide (DMSO) is a highly polar organic reagent that has exceptional solvent properties for organic and inorganic chemicals. Among its uses in organic synthesis is the oxidation of thiols and disulfides to sulfonic acids.[2] Other reactions in which DMSO participates include the hydrolysis of epoxides, the thioalkylation of phenols, and the oxidation of primary alcohols, primary halides, and esters of primary alcohols to aldehydes.[3]

DMSO is also widely utilized in the storage of human and animal cell lines and bacteriophage λ, as a cryoprotective agent.[4] A protocol to prepare a DMSO solution for freezing cells is as follows:

1) Prepare freezing medium containing culture medium with 10-20% serum and 5-10% DMSO.
2) Remove adherent cells with trypsin or other appropriate means. (For optimal results, cells should be in the log phase of growth.)
3) Gently pellet the cells by centrifugation (10 minutes at 250 × *g*, 4 °C) and remove the culture medium.
4) Resuspend the cells in the freezing medium at 10^6 -10^7 cells/ml.
5) Aliquot into freezing vials.
6) Freeze cells according to standard freezing protocols. Store at -70 °C or below.

For cell fusion, a 10% DMSO solution in 40-50% polyethylene glycol (PEG) may be prepared.[4]

Protocols have been reported for the use of DMSO in column-loading buffers for poly(A)$^+$ RNA selection, in buffers for the transformation of competent *E. coli*, in the polymerase chain reaction (PCR), the amplification of cDNA libraries, DNA sequencing, DEAE-dextran mediated transfection of cells, and polybrene-mediated DNA transfection.[4] A procedure that uses DMSO to recover DNA from membrane filters for subsequent PCR amplification has been described.[5] A capillary electrophoresis technique for DNA sequencing incorporates 2 M urea with 5% DMSO (v/w), and can be modified to use 100% DMSO as needed.[6] A study of the contribution of various DMSO concentrations to melting temperatures in oligonucleotides has been published.[7]

The use of DMSO to enhance monoclonal antibody production in hybridoma cells has been described.[8] A study has investigated the incubation of hybridoma cells at elevated temperatures in DMSO-containing medium prior to cryopreservation.[9]

The use of DMSO in the modification of phosphoserine and phosphothreonine residues in proteins for MS analysis of phosphorylation states has been described.[10] A study of leuprolide degradation in water and in DMSO has been reported.[11]

The compatibility of DMSO with various materials is listed below:

- Compatible: LDPE, HDPE, polypropylene, PPCO (polypropylene copolymer), polymethylpentene, nylon, teflon FEP
- Moderately compatible: polystyrene, ECTFE/ETFE
- Incompatible: polysulfone, flexible and rigid PVC tubing, polycarbonate

Precautions and Disclaimer

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

Preparation Instructions
This product is miscible in water
(1 ml DMSO + 1 ml H_2O), yielding a clear, colorless solution. DMSO is a very hygroscopic liquid and should protected from exposure to moisture. DMSO is also soluble in ethanol, acetone, ether, benzene, and chloroform.[1]

Storage/Stability
DMSO supercools easily and remelts slowly at room temperature. The product may arrive as a solid instead of a liquid. The solidified product can be reliquified by warming to room temperature without detriment to the product. DMSO is stable up to 100 °C in alkaline, acidic and neutral conditions. At temperatures approaching its boiling point, DMSO is stable in neutral or alkaline conditions.

To prepare a sterile filtered DMSO solution, it is recommended to use a teflon or nylon membrane. Cellulose acetate membranes are not recommended.

References

1. The Merck Index, 12th ed., Entry# 3308.
2. Lowe, O. G., Oxidation of thiols and disulfides to sulfonic acids by dimethyl sulfoxide. J. Org. Chem., **41(11)**, 2061 - 2064 (1976).
3. Advanced Organic Chemisry: Reactions, Mechanisms, and Structure, March, J., John Wiley & Sons (New York, NY: 1991), pp.. 376-377, 1168, 1193-1195.
4. Molecular Cloning: A Laboratory Manual, 3rd ed., Sambrook, J. and Russell, D.W., CSHL Press (Cold Spring Harbor, NY: 2001), pp. 1.105-1.106, 2.36, 7.16, 8.9, 8.23, 11.64, 12.39, 16.28, 16.43-16.45.
5. Chong, K. Y., et al., Post-hybridization recovery of membrane filter-bound DNA for enzymatic DNA amplification. Biotechniques, **14(4)**, 575-578 (1993).
6. Kotler, L., et al., DNA sequencing of close to 1000 bases in 40 minutes by capillary electrophoresis using dimethyl sulfoxide and urea as denaturants in replaceable linear polyacrylamide solutions. Electrophoresis, **23(17)**, 3062-3070 (2002).
7. von Ahsen, N., et al., Oligonucleotide melting temperatures under PCR conditions: nearest-neighbor corrections for Mg^{2+}, deoxynucleotide triphosphate, and dimethyl sulfoxide concentrations with comparison to alternative empirical formulas. Clin. Chem., **47(11)**, 1956-1961 (2001).
8. Ling, W. L., et al., Improvement of monoclonal antibody production in hybridoma cells by dimethyl sulfoxide. Biotechnol. Prog., **19(1)**, 158-162 (2003).
9. Wewetzer, K., and Dilmaghani, K., Exposure to dimethyl sulfoxide at 37 °C prior to freezing significantly improves the recovery of cryopreserved hybridoma cells. Cryobiology, **43(3)**, 288-292 (2001).
10. Thaler, F., et al., A new approach to phosphoserine and phosphothreonine analysis in peptides and proteins: chemical modification, enrichment via solid-phase reversible binding, and analysis by mass spectrometry. Anal. Bioanal. Chem., **376(3)**, 366-373 (2003).
11. Hall, S. C., et al., Characterization and comparison of leuprolide degradation profiles in water and dimethyl sulfoxide. J. Pept. Res., **53(4)**, 432-441 (1999).

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