FT-996180(MTSreagents)

MTS reagents

Description - Charged MTS reagents

Positively charged reagent that reacts very rapidly and specifically with cysteine groups.
Useful tools for protein (transporters, receptors…) structure and activity studies

These reagents would fit inside a cylinder about 0.6nm in diameter and 1nm in length (Akabas 1992).

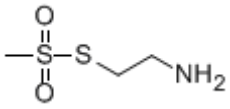
MTSEA — UP996180 — 100mg 500mg 1g

2-Aminoethyl MethaneThioSulfonate Hydrobromide

CAS [16599-33-0]; **MW 236.16** (x)

Soluble in Ethanol, Methanol, Water

Half-life (pH7.0, 20°C): ca 12 min,
Half-life (pH6.0, 20°C): ca 92 min,
Half-life (pH7.0, 4°C): ca 116 min (Karlin 1998)



Soluble in water, DMSO or DMF

References

MTSEA biotin — UPR57520 — 10mg 50mg

2-((biotinoyl)amino)ethyl MethaneThioSulfonate

MW 381.52 (J)

Soluble in DMF, or DMSO at >10 mg/mL at 20°C

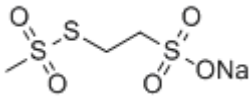
MTSES — AM3720 — 100mg 500mg 1g

Sodium (2-sulfonatoethyl) MethaneThioSulfonate

CAS [184644-83-5]; **MW 242.27** (J)

Soluble in DMF, DMSO, Hot Ethanol, Methanol, Water

Half-life (pH7.0, 20°C): ca 370 min (Karlin 1998)



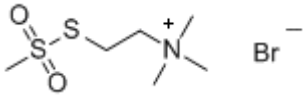
References

MTSET — U03510 — 100mg 500mg 1g

(2-(trimethylammonium)ethyl)MethaneThioSulfonate bromide

CAS:[91774-25-3]; **MW 278.24** (J)

Half-life (pH7.0, 20°C): ca 11.2 min
Half-life (pH6.0, 20°C): ca 55 min (Karlin 1998)



Other MTS reagents :

Charged MTS reagents [Cys-MTS, RQ051], [MTSEA-Chloride, U5499], [MTSPA, AM373, [RR583], [MTSBS, RW311], [MTSPES, RW312], [MTSPS, RW313], [MTS-TEAH, RQ189], [MTS-PtrEA, RW600], [MTSET 14C2, RW657], [RW659]], [MTSMT, RQ190], [MTSPT, RW665]

Neutral MTS reagents

Spin labelled MTS reagents

Fluorescent labelled reagents

Biotinylated rMTS reagents

Photoaffinity reagents

MTS Crosslinkers

Directions for use

Storage and Handling

Some methanethiosulfonates are hygroscopic and all hydrolyze in water, over a period of time, particularly in the presence of nucleophiles. They should be stored in a desiccator at -20°C and warmed up to room temperature before opening the vial. For maximum results, solutions should be made up immediately prior to use even though solutions in distilled water appear to be stable for hours at 4°C.

· DMSO is a good solvent for the MTS reagents which are not water soluble (i.e. the non-charged MTS reagents).

MTS reagents decompose in buffer very quickly (hydrolyzes) more or less rapidly (see half-life in page 1).

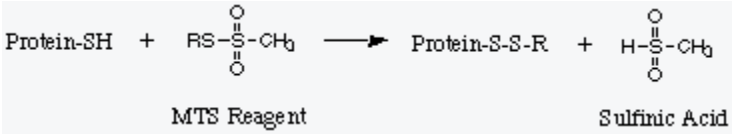
Protocols

Refer to the literature and following general information.

Routinely, one can use 2.5 mM MTSEA, 1 mM MTSET, or 10 mM MTSES, applied for 1 to 5 minutes. (MTSET is 2.5 times as reactive with small sulfhydryl compounds as is MTSEA, and 10 times as reactive as MTSES). (ref).

General Information

- MTS reagents are alkylthiosulfonates that have proven favorable when compared to traditional reagents (iodoacetates, maleimides, and organomercurials) due to the facility with which cysteine residues are stoichiometrically alkanethiolated under mild conditions (Kenyon 1977). This is a specific and rapid process by which cysteine sulfhydryls are converted to a disulfide. The reaction pathway is potentially reversible upon the addition of thiols such as DTT (#UP28425).



- MTS reagents allow useful probing of the structures and function of proteins. Their use combined to site-specific mutagenesis has proved to be an extremely useful technique in the mapping of membrane proteins, in example for ion channels and transports proteins, as well as enzymes and receptors.

  The mapping of membrane proteins has advanced considerably with the advent of cloned and expressed membrane proteins and the use of site-directed mutagenesis. A useful strategy is to introduce individual cysteine residues at various positions in a protein and to observe modifications in cell functions or detect introduced cysteins in cell.

- The chemical modification by a charged MTS reagent of cysteine residues (that have been introduced in a specific protein by mutagenesis) may produce a measurable change in the function of the ion channel/transport protein, which can be measured by electrical recording or isotope flux. Such data give valuable information concerning the time-course, state dependance and membrane-sidedness of the accessibility of the cysteine (Akabas 1992, Stauffer 1994). This is referred to as substitued-cysteine-accessibility method (SCAM) (Akabas 1994). The MTS reagents can be employed in whole cell current measurements to identify changes in mutants from wild type behavior or in single channel recording .

- **Biotinylated MTS reagent**s, such as MTSE UPR5752 can be easily detected with (strept)avidin reagents, i.e.:

  Streptavidin, peroxidase conjugated UP395880
  Streptavidin, phosphatase alkaline conjugated UP518490

  For example one may test the surface accessibility on cells of membrane proteins that contain cysteines, and may have been introduced by SCAM method.

More information – Advantages of MTS Reagents

Sulfhydryl active reagents have been used as blocking and labeling groups, reporter groups, cross-linking groups and affinity labeling groups for the chemical modification of peptides and proteins (Kenyon1977). **Classic reactive functionalities** are maleimides, iodoacetates, and organomercurials, which are in general slow to react, therefore require long reaction times and large excess of reagent. **Alkylthiosulfonates** are distinguished by their extremely rapid reactivity under the mild conditions necessary for successful electrophysiological recording experiments, their high selectivity for cysteinyl sulfhydryls, their ability to effect quantitative and complete conversion to the disulfide without applying a large excess of reagent, the general reversibility of the formation of disulfide bond upon the addition of thiols such a ß-mercaptoethanol or dithiothreitol (Kenyon1977)., and the wide range of functionality accommodated in the R group.

Even at mM concentration of proteins, stoichiometric sulfhydryl group modification may be achieved in solutions of either anhydrous organic or buffered aqueous and aqueous-organic solvents. Also, the sulfinic acid byproduct of the reaction of a sulfhydryl with a methanethiosulfonate, decomposes rapidly to low-molecular-weight volatile products which do not, in general, affect the stability of the disulfide bond formed, or the activity of the enzyme (Bruice and Kenyon, 1982).

The intrinsic reactivity of MTS reagents with thiols is quite high, on the order of 10^5 M-1 sec-1 (Stauffer and Karlin, 1994). Similar rates can often be achieved with introduced cysteines in proteins (Liu et al. 1996; Holmgren et al., 1996b). Hence complete modification can be achieved using a few seconds of application and reagent concentrations in the 10-100 µM range (assuming a stoichiometric excess of reagent or continuous application of fresh reagents).
-Slower rates of modification may indicate that the introduced cysteine is not at the freely accessible surface of the protein, but is partially buried in a crevice or possibly in the pore of a channel protein.
-Sometimes an introduced cysteine may exhibit different modification rates depending on the conformational state of the protein. This phenomenon has allowed the MTS reagents to be used to analyze the nature of ion-channel gating motions (Akabas et. al., 1992, 1994; Yang and Horn, 1995; Yang et al. 1996; Larsson et al., 1996; Liu et al., 1996).

When modification is monitored by a functional measurement rather than by protein chemistry, a failure to see an effect of an MTS reagent may indicate either that the modification reaction did not occur or that even when modification does occur it produces no functional change in the assay used. A change in conductance of a channel may be caused by a change in protein structure caused by modification of a cysteine at a remote site (Mindell et. al 1994).

MTS derivatives are, by far, the most rapidly reacting amongst the sulfhydryl active reagents. Even so, their application is over a relatively long time relative to the time frame of protein motion. As a consequence the reagent may react with a minor channel conformation (Lu and Miller, 1995). Attempts to overcome the problem using very brief applications of reagents have been reported (Cheung and Akabas, 1996).

When used for determining membrane protein topology, it is important to consider the ability of MTS compounds to cross membranes. Although MTSES and MTSET are membrane impermeant, MTSEA can modify membrane proteins from the "wrong side" (Yellen and his colleagues, in Holmgren et. al., 1996) . The rate of wrong-sided or "trans" modification in excised membrane patches was about 30-fold slower than for right-sided application. Even the normally membrane impermeant MTSET could produce trans-membrane modification in patches that showed a transient electrical leak. The use of a thiol scavenger (such as 20 mM cysteine), on the opposite side of the membrane from where the MTS reagent is applied, is recommended to eliminate this "trans" modification.

Charged MTS Reagents

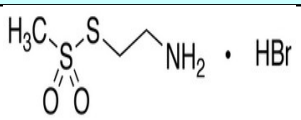
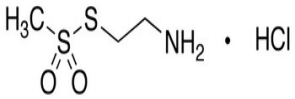
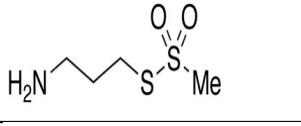
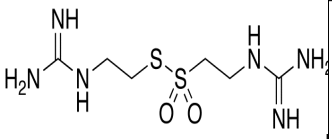
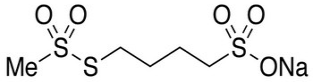
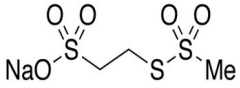
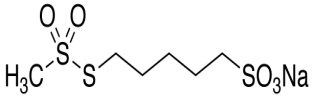
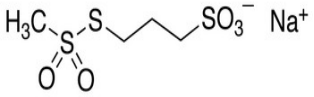
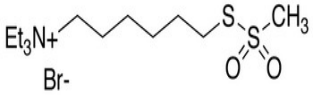
Arthur Karlin and his colleagues introduced three charged MTS reagents, 2-Aminoethyl methanethiosulfonate hydrobromide (MTSEA, Cat. # A609100), Sodium (2-sulfonatoethyl) methanethiosulfonate (MTSES, Cat. # S672000), and [2-(Trimethylammonium)ethyl] methanethiosulfonate bromide (MTSET, Cat. # T795900). These reagents were used in conjunction with site specific introduction of cysteines to study the structure and function of ion channel proteins (SCAM). Because these reagents introduce a positive or negative charge at the position of a previously neutral cysteine residue they frequently give a functional change in a channel protein that can be measured by electrical recording (Stauffer and Karlin, 1994; Akabas et al., 1992).

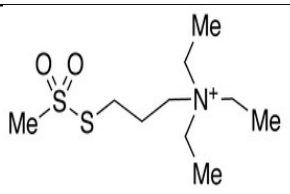
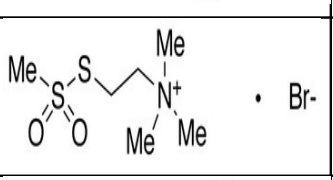
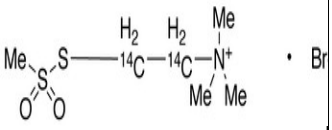
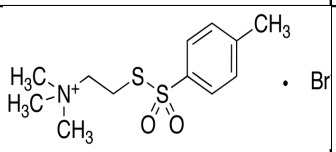
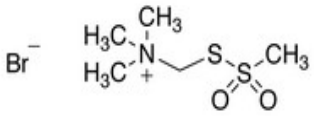
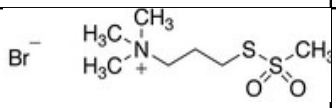
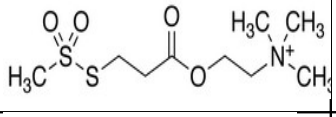
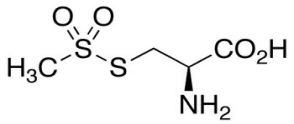
SCAM and the charged MTS reagents have been successfully applied to the structural and functional elucidation of a number of ligand-gated ion channels, including muscle acetylcholine receptor (Akabas et al., 1992, 1994a, 1995), neuronal acetylcholine receptor (Ramirez-Latorre et al., 1996), GABA receptor (Xu and Akabas, 1993, 1996), NMDA glutamate receptor (Kuner et al., 1996), and cyclic nucleotide gated channels (Sun et al., 1996). This technique has also been applied to the cystic fibrosis transmembrane conductance regulator (Akabas et al., 1994b), and to voltage-gated potassium (Pascual et al., 1995; Kürz et al., 1995) and sodium

channels [Yang et al. 1996]. SCAM has also been used to map the ligand-binding domain of the seven-transmembrane-helices, G-protein-linked dopamine receptor [Javitch et al., 1995; Fu et al., 1996].

The serotonin transporter belongs to a large family of integral membrane proteins responsible for terminating the action of neurotransmitters released from presynaptic neurons. Gary Rudnick and his colleagues used site-directed mutagenesis and MTS reagents to study this transporter [Humphreys et. al., 1994; J.-G. Chen et. al., 1997] and have identified the specific amino acid residues important for binding serotonin and cocaine and for conformational changes.

Ion channels are dynamic transmembrane proteins that undergo conformational changes when they open and close. Several physiologically important factors influence this gating process, including binding of agonists and changes of the transmembrane potential. However the way the channel protein transduces these signals into gating is largely unknown. Dick Horn and his colleagues have studied a particular voltage-dependent conformational change in sodium channels, which are responsible for the action potential in excitable cells. Using site-specific mutagenesis, they showed that the transmembrane potential affects the accessibility of the cysteine residues to the methanethiosulfonate reagents MTSES and MTSET [Yang and Horn, 1995; Yang, George and Horn, 1996].

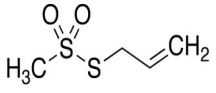
Charged MTS Reagent	Short name	Structure	Cat.#
2-Aminoethyl methanethiosulfonate, hydrobromide; CAS[16599-33-0]; MW:236.16 [M]	MTSEA-Bromide		996180
2-Aminoethyl methanethiosulfonate, hydrochloride; CAS[37597-96-9]; MW:191.7 [M] Soluble in DMSO, Warm Ethanol, Methanol, Water,	MTSEA-Chloride		U54991
3-Aminopropyl methanethiosulfonate, hydrobromide; CAS[92953-13-4]; MW:250.18 [M] Soluble in DMSO, Methanol	MTSPA		AM3731
2-Guanidinoethyl 2-guanidinoethanethiosulfonate, dihydrobromide; CAS[-]; MW:813.14 [M] Soluble in DMSO, Methanol, Water	-		RR5830
Sodium (4-sulfonatobutyl)methanethiosulfonate; CAS[385398-78-7]; MW:270.32 [M] Soluble in DMSO, Methanol, Water	MTSBS		RW3110
(2-sulfonatoethyl)methanethiosulfonate; CAS[1950-85-2]; MW:233.29	MTSES		U03500
Sodium (5-sulfonatopentyl) methanethiosulfonate; CAS[385398-80-1]; MW:284.35 [M] Soluble in DMF, DMSO, Methanol	MTSPES		RW3120
Sodium (3-sulfonatopropyl) methanethiosulfonate; CAS[385398-83-4]; MW:256.3 [M] Soluble in DMSO, Water	MTSPS		RW3130
6-(Triethylammonium)hexyl methanethiosulfonate bromide; CAS[386229-78-5]; MW:376.43 [M] Soluble in DMSO, Methanol, Water	MTS-TEAH		RQ1890

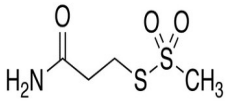
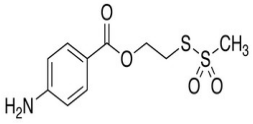
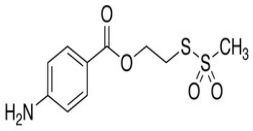
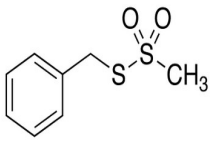
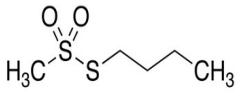
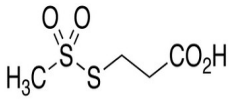
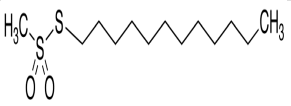
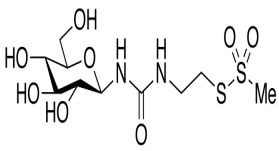
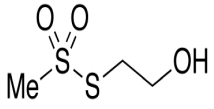
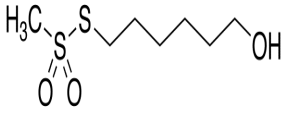
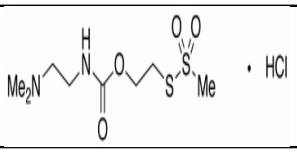
3-(Triethylammonium)propyl methanthiosulfonate bromide; CAS[219789-15-8]; MW:334.35 (M) Soluble in DMSO, Methanol, Water	MTS-PtrEA		RW6000
[2-(Trimethylammonium)ethyl] methanethiosulfonate bromide; CAS[91774-25-3]; MW:278.24 (M) Soluble in Methanol, Water	MTSET		U03510
[2-(Trimethylammonium)ethyl] methanethiosulfonate bromide 14C2; CAS[-]; MW:282.22 (M) Soluble in DMSO, Water	MTSET 14C2		RW6570
2-(Trimethylammonium)ethyl toluenethiosulfonate bromide; CAS[-]; MW:354.32 (M) Soluble in DMSO, Water			RW6590
(Trimethylammonium)methyl methanethiosulfonate bromide; CAS[386229-81-8]; MW:264.73 (M) Soluble in DMSO, Methanol	MTSMT		RQ1900
3-(Trimethylammonium)propyl methanethiosulfonate bromide; CAS[220560-60-1]; MW:292.26 (X) Soluble in DMSO, Metahnol, Water	MTSPT		RW6650
2-Carboxyethyl Methanethiosulfonate, Choline Ester Chloride Salt; CAS[-]; MW: 305.84			RT1510
2-(Aminocarbonyl)ethyl methanethiosulfonate; CAS[351422-29-2]; MW:199.25 (X) Sparingly soluble in DMSO, Water Ge, P., and Selvin, P.R.: Bioconjugate Chem., 14, 5, 870 (2003)	Cys-MTS		RQ0510

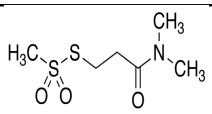
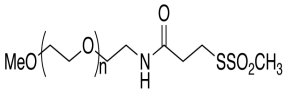
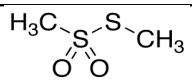
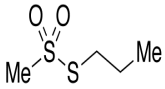
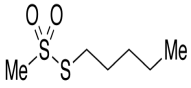
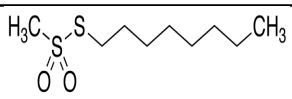
Neutral MTS Reagents

Uncharged MTS reagents are also useful sulfhydryl active probes for channels of known or unknown structure, particularly when used in conjunction with site-specific mutagenesis.

A study (Chahine et. al. 1997) showed that MTSBn reagent restored function in a channel that had been made inactivation-defective by the substitution of the phenylalanine at position 1486 with cysteine, supporting the theory that the phenyl group of the phenylalanine may play a crucial role in inactivation gate closure.
The thermal cis-trans isomerization of the carbamate MTSAC reagent was found (Foong et. al., 1997; Woolley et. al., 1995) to alter the flux of Cs+ ions through the gramicidin channel, detected as steps in single-channel recordings.

Neutral MTS Reagent	Short name	Structure	Cat.#
Allyl methanethiosulfonate; CAS[14202-77-8]; MW:152.241 (K)	Allyl MTS		RO8900

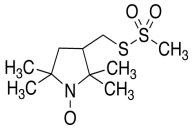
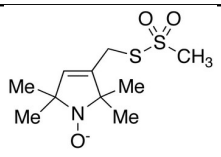
2-Amino-2-carboxyethyl methanethiosulfonate; CAS[351422-28-1]; MW:183.25	-		RQ0500
2-(4-Aminobenzoyloxy)ethyl methanethiosulfonate; CAS[-]; MW:183.25 (M)	-		
Benzocaine methanethiosulfonate; CAS[212207-24-4]; MW:275.34 (M) Soluble in Acetone, Chloroform, Ethanol, Methanol	-		Inquire
Benzyl methanethiosulfonate; CAS[7559-62-8]; MW:202.3 (M) Sioluble in Acetone, Chloroform, Dichloromethane, Ethanol, Ether, Methanol	MTSBn		RR1620
Butyl methanethiosulfonate; CAS[52017-46-6]; MW:168.28 (K) Soluble in Ethanol, Ethyl Acetate, Hexane	-		RQ4340
2-Carboxyethyl methanethiosulfonate; CAS[92953-12-3]; MW:184.23 (M) Soluble in Acetone, Chloroform, Dichloromethane, Ethyl Acetate, Methanol	MTSCE		CG2510
Decyl methanethiosulfonate ; CAS[190852-38-1]; MW:252.44 (M) Water sensitive Soluble in Ethanol, Ethyl Acetate, Hexane	-		RP4020
Dodecyl methanethiosulfonate; CAS[355803-77-9]; MW:280.5 (X) Soluble in Dichloromethane	-		RQ0710
N-(ß-D-Glucopyranosyl)-N'-[(2-methanethiosulfonyl)ethyl]urea; CAS[-]; MW:360.41 (X) Soluble in Methanol	MTS-5-Glucose		RU5060
Hexadecyl methanethiosulfonate Hexane; CAS[7559-47-9]; MW:336.6 (M Solubled in Chloroform, Dichloromethane, Ethyl Acetate Water sensitive			RR1610
2-Hydroxyethyl methanethiosulfonate; CAS[13700-08-8]; MW:156.22 (K) Soluble in Dichloromethane, Ether, Ethyl Acetate, Methanol	MTSHE		RO8240
6-Hydroxyhexyl methanethiosulfonate; CAS[212261-98-8]; MW:212.33	6-HH-MTS		RP5700
O-2-(Methanethiosulfonyl)ethyl N-[2-(N,N-dimethylamino)ethyl] carbamate, hydrochloride; CAS[185792-54-7]; MW:306.83	MTSAC		RP3710

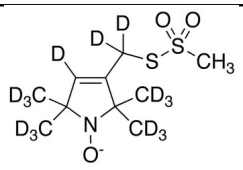
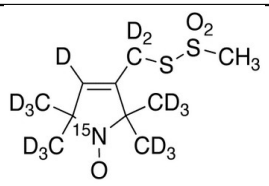
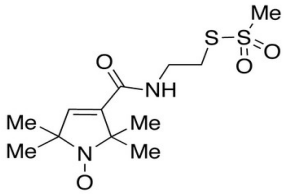
3-Methanethiosulfonyl-N,N-dimethylpropionamide; CAS[359436-82-1]; MW:211.3 (X)	MTS-DMPA		RQ1000
Methoxypoly(ethylene glycol)-5000-succinamidoethyl methanethiosulfonate	MTS-PEG5000		Inquire
Methoxypoly(ethyleneglycol)20 Amidopropionyl Methanethiosulfonate	MTS-mPEG20		
Methyl methanethiolsulfonate; CAS[2949-92-0]; MW:126.20 (M)	MMTS		417311
Propyl methanethiosulfonate; CAS[24387-69-7]; MW:154.25	-		RP7230
Pentyl methanethiosulfonate; CAS|4212-65-0]; MW:182.31	-		RQ2800
Octyl methanethiosulfonate; CAS[7559-45-7]k; MW:224.38	-		RR1600
Pyridinedithioethylamine, hydrochloride	PDA		Inquire

Spin Labeled MTS Reagents (MTSL)

The spin labeled derivative of MTSL, proxyl-MTS (1-Oxyl-2,2,5,5-tetramethyl-Æ3-pyrrolin-3-yl)methyl methanethiosulfonate) has been described (Berliner et. al., 1982) : it exhibits high sulfhydryl selectivity and reactivity. The side-chain has a relatively small molar volume, and the EPR spectrum, which measures the accessibility to collision with paramagnetic species in solution (an indication of its solvent accessibility), and the motion of the spin-labeled side-chain, is exquisitely sensitive to structural changes. Site directed spin labeling (SDSL) and analysis of the electron paramagnetic resonance of spin labeled proteins can be used to map the topography of a membrane protein, to determine secondary structure, measure the distance between two sites bearing a spin label, and identify sites of tertiary interaction. The ability to time-resolve these structural features makes SDSL a powerful approach for exploring the evolution of structure on the millisecond time-scale. Future applications are anticipated to include the study of protein folding both in solution and in chaperone-mediated systems (Hubbell et al. 1996, Hubbell and Altenbach 1994, Hubbell and Altenbach in : Membrane Protein Structure: Experimental Approaches, 1994).

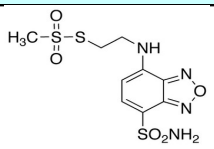
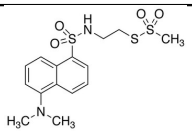
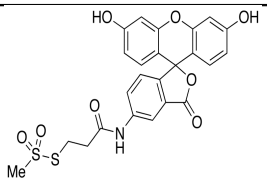
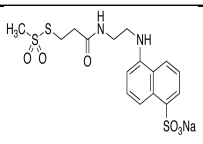
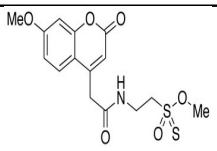
MTSL was used in the study of T4 lysozyme (Mchaourab et. al., 1996 - a key paper for interpreting the MTSL spectral lineshape). The quantitative analysis of spin-spin interactions between nitroxide pairs revealed an 8 Å relative movement upon substrate binding (Mchaourab et. al., 1997). MTSL was also used in studies of: 1. the interaction of the toxin colicin E1 with membranes (Shin et. al. 1993); 2. structure, and structural changes of rhodopsin (Farrens et. al., 1996), and bacteriorhodopsin during the photocycle (Altenbach et. al. 1990; Steinhoff et. al. 1994); 3. the diphtheria toxin transmembrane domain (Oh et. al., 1996).

Spin Labeled MTS Reagent	Short name	Structure	Cat.#
(1-Oxyl-2,2,5,5-tetramethylpyrrolidin-3-yl)methyl methanethiosulfonate; CAS[201403-46-5]; MW:266.4 (M)	proxyl-MTS		RV9770
(1-Oxyl-2,2,5,5-tetramethyl-Æ3-pyrrolin-3-yl)methyl methanethiosulfonate; CAS[81213-52-7]; MW:264.39 (M)	MTSL		BU2956

(1-Oxyl-2,2,5,5-tetramethyl-Æ3--pyrrolin-3-yl)methyl methanethiosulfonate-d15; CAS[384342-57-8]; MW:239.7	MTSL-D_{15}		RV9790
(1-Oxyl-2,2,5,5-tetramethyl-Æ3--pyrrolin-3-yl)methyl methanethiosulfonate-15N-d15; CAS|-]; MW:280.49	MTSL- ^{15}N-D_{15}		RV9800
(1-Oxyl-2,2,5,5-tetramethylpyrrolin-3-yl)carbamidoethylmethanethiosulfonate; CAS[384342-59-0]; MW:321.44	MTS-4-Oxyl		RV9810

Fluorescent MTS Reagents

The MTS-fluorophores may find application in the real-time monitoring of conformational changes, since fluorophores coupled to introduced cysteines can change their fluorescence during a conformational change (Mannuzzu et al., 1996). Fluorescence lifetime may also yield information regarding distances and molecular motion in a protein molecule.

Fluorescent Labeled MTS Reagent	Short name	Structure	Cat.#
N-[4-(Aminosulfonyl)-2,1,3-benzoxadiazol-7-yl]-2-aminoethyl methanethiosulfonate; CAS[35200-01-2]; MW:352.41	ABD-MTS		FP-CP7020
Dansylamidoethyl methanethiosulfonate [2-(5-Dimethylaminonaphth-1-yl sulfonamido)ethyl methanethiosulfonate]; CAS[355115-41-2]; MW:388.53	MTS-Dansyl		FP-CP7030
(N-Dansyl)biocytinamidoethyl methanethiosulfonate; CAS[255115-41-2]; MW:743	MTS-DB		FP-RT4840
2-[(5-Fluoresceinyl)aminocarbonyl]ethyl methanethiosulfonate; CAS[-]: MW:513.55	MTS-4-Fluorescein		FP-R59300
N-(methanethiosulfonylethylcarboxamidoethyl)-5-naphthylamine-1-sulfonic acid, sodium salt; CAS|359436-83-2]; MW:454.51	MTS-1,5-EDANS-Carboxyethyl		RV1080
N-[2-Methanethiosulfonylethyl]-7-methoxycoumarin-4-acetamide; CAS[887406-79-3]; MW:371.43	MTS-EMCA		FP-RR5040

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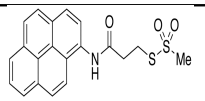
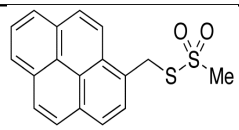
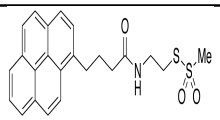
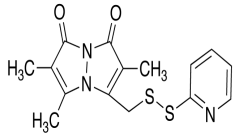
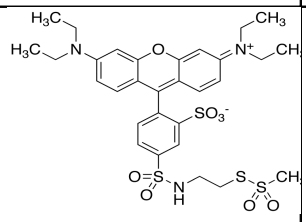
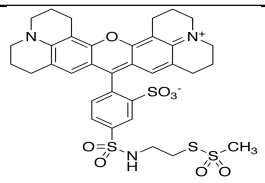
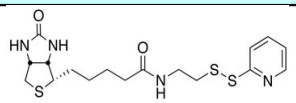
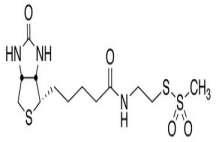
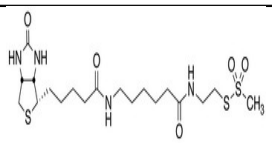
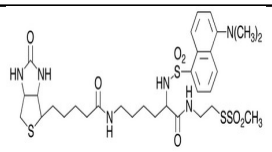
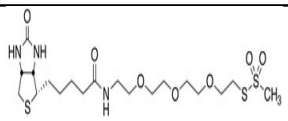
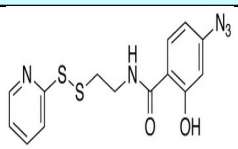
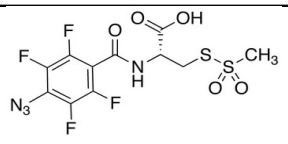
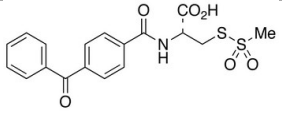
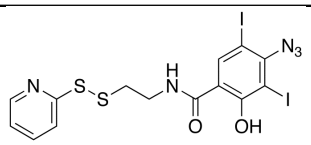
2-(Pyren-1-ylaminocarbonyl)ethyl methanethiosulfonate; CAS[384342-67-7]; MW:383.49	Pyrene-ACE-MTS		FP-RQ1770
1-Pyrenylmethyl methanethiosulfonate; CAS[384342-65-8]; MW:326.44	Pyrene-1-MTS		FP-RQ1780
2-[(3-Pyrenylpropyl)carboxamido]ethyl methanethiosulfonate; CAS[384342-66-9]; MW:425.56	Pyrene-7-MTS		FP-RQ1790
(2-Pyridyl)dithiobimane; CAS[385398-64-1]; MW:333.43	PDT-Bimane		RQ1800
Sulfo-rhodamine methanethiosulfonate; CAS[386229-71-6]; MW:695.88	MTSR		FP-RW3650
1-[Bis(Trifluoromethanesulfonyl)Methyl]-2,3,4,5,6-Pentafluorobenzene; CAS[405074-81-9]	-		BJ3200
Bis(Trifluoromethanesulfonyl)Methyltetrafluorophenyl Polysyrene Resin	-		BJ3210
SulfoRhodamine101-2-Sulfonamidoethyl methanethiosulfonate; CAS[-]; MW:743.94 (M)0 Soluble in Chloroform, DMSO ; A/E:582/600	SR101-MTSEA		FP-BJ1970

Biotin Labeled MTS Reagents

Spin Labeled MTS Reagent	Short name	Structure	Cat.#
Biotin-[2-(2-pyridyldithio)ethylamide]; CAS[112247-65-1]; MW:412.6	PDTE-Biotin		RO4700
N-Biotinoylaminoethyl methanethiosulfonate; CAS[162758-04-5]; MW:381.54	MTSEA-Biotin		RP1620
N-Biotinoylcaproylaminoethyl methanethiosulfonate; CAS[353754-95-7]; MW:494.7	MTSEA-lc-Biotin		RQ0600
(N-Dansyl)biocytinamidoethyl methanethiosulfonate; CAS[-]; MW:743	MTS-DB		RT4845
1-Biotinylamino-3,6,9-trioxaundecane-11-yl-methanethiosulfonate; CAS[-]; MW:513.69	MTS-PEO_3-Biotin		BV5950

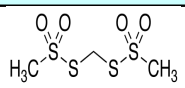
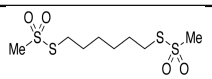
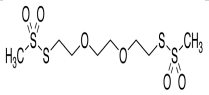
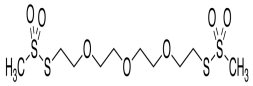
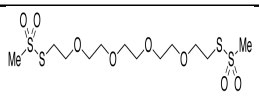
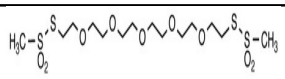
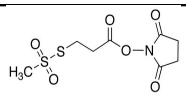
Photoaffinity Reagents

Photoreactive MTS Reagent	Short name	Structure	Cat.#
S-[2-(4-Azidosalicylamido)ethylthio]-2-thiopyridine; CAS[164575-82-0]; MW:347.42	-		RP1750
4-Azido-2,3,5,6-tetrafluorobenzamidocysteine methanethiosulfonate; CAS[35200-06-7]; MW:416.33	-		RQ0520
Benzophenone-4-carboxamidocysteine methanethiosulfonate; CAS[317821-69-5]; MW:407.47	-		RS3780
S-[2-(Iodo-4-azidosalicylamido)ethylthio]-2-thiopyridine; CAS[175093-14-8]; MW:599.21	IAE		RP2670

FT-996180(MTSreagents)

MTS Crosslinkers

MTS crosslinkers, which can be used to crosslink cysteines will find application in the topographical mapping of proteins. The use of different length linkers can assist in the determination of the distance between two cysteine residues. Crosslinkers might also be used to stabilize protein conformation.

Crosslinker MTS Reagent	Short name	Structure	Cat.#
1,1-Methanediyl bismethanethiosulfonate; CAS[22418-52-6]; MW:236.35	MTS-1-MTS		RP6570
1,2-Ethanediyl bismethanethiosulfonate; CAS[55-95-8]; MW:250.38	MTS-2-MTS		RQ5480
1,3-Propanediyl bismethanethiosulfonate; CAS[55-96-9]; MW:264.41	MTS-3-MTS		RQ5490
1,4-Butanediyl bismethanethiosulfonate; CAS[55-99-2]; MW:278.43	MTS-4-MTS		RQ5510
1,5-Pentanediyl bismethanethiosulfonate; CAS[56-00-8]; MW:292.46	MTS-5-MTS		RQ5520
1,6-Hexanediyl bismethanethiosulfonate; CAS[56-01-9]; MW:306.49	MTS-6-MTS		RQ5530
3,6-Dioxaoctane-1,8-diyl bismethanethiosulfonate; CAS[212262-04-9]; MW:338.49	MTS-8-PEO_2-MTS		U95040
3,6,9-Trioxaundecane-1,11-diyl bismethanethiosulfonate; CAS[212262-02-7]; MW:382.54	MTS-11-PEO_3-MTS		RP5710
3,6,9,12-Tetraoxatetradecane-1,14-diyl bismethanethiosulfonate; CAS[212262-08-3]; MW:426.59	MTS-14-PEO_4-MTS		RP5720
3,6,9,12,15-pentaoxaheptadecane-1,17-diyl bis-methanethiosulfonate; CAS[-]; MW:470.65	MTS-17-PEO_5-MTS		U95050
N-Succinimidyloxycarbonylethyl methanethiosulfonate; CAS[385399-11-1; MW:281.30	MTS-3-NHS		RQ1810

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