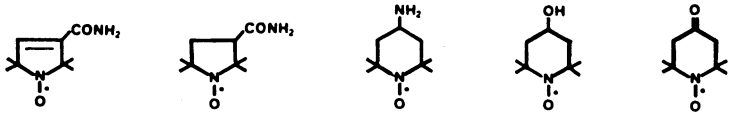
Nitroxide spin labels



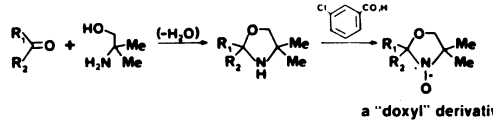
15.568-3 16.391-0 16.394-5 17.614-1 17.948-5

Spin labeling, a term coined by Stone *et al.*,[1] refers to the use of stable free radicals as reporter groups. The paramagnetic resonance spectrum of the spin label, or the effect of the spin label on nuclear resonance spectra, or both, can provide significant information on molecular structure and dynamics in biological systems. The most commonly used **spin labels** are molecules which contain a nitroxide moiety.

Nitroxides are unreactive under a variety of experimental conditions, stable in aqueous solutions to moderate heating (up to 70-80°) and to pH changes over the range of 3 to 10, and nontoxic to most biological systems. They can be reduced to the hydroxylamines by many mild reducing agents, but are not affected by two-electron reductants. Reduction to the secondary amines requires stronger reducing agents than are usually encountered in biological systems.

Nitroxide spin labels have been extensively used in the studies of biomembranes and membrane models, the geometry of binding sites (*e.g.*, antibody combining sites, enzyme active sites), conformational changes in macromolecules (proteins such as hemoglobin, nucleic acids such as *t*RNA), enzyme mechanisms, and immunoassays of drugs. For the aforementioned studies, compounds such as ADP, ATP, vitamin B_{12}, hemoglobin, morphine, etc., have been spin-labeled with nitroxides.

The preformed nitroxide spin labels we offer carry amino, hydroxyl or oxo functions through which specific compounds of interest may be attached. Alternatively, a 4,4-dimethyloxazolidine-*N*-oxyl (or simply "doxyl") moiety can be synthesized by the method of Keana *et al.*[2] from a keto group in the molecule to be studied.



a "doxyl" derivative

In addition to their use as spin labels, nitroxides find other applications simply because they are stable free radicals, *e.g.*, 17,614-1 and 17,948-5 are inhibitors in the polymerization of dienes and vinyl compounds. These two compounds are efficient antioxidants in trialkylboranes,[3] lipids, feeds (to stabilize carotene), and are inhibitors in the thermooxidative degradation of polycaproamide (nylon). They also possess antitumor activity, particularly against hematocytoplasts in the peripheral blood and bone marrow.[4]

References:

1) T.J. Stone, T. Buckman, P.L. Nordio, and H.M. McConnell, *Proc. Nat. Acad. Sci. U.S.*, **54**, 1010 (1965).
2) J.F. Keana, S.B. Keana, and D. Beetham, *J. Amer. Chem. Soc.*, **89**, 3055 (1967).
3) P.G. Allies and P.B. Brindley, *Chem. Ind.*, 1439 (1968).
4) N.P. Konovalova, G.N. Bogdanov, V.B. Miller, M.B. Neiman, E.G. Rozantsev, and N.M. Emanuel, *Dokl. Akad. Nauk SSSR*, **157**, 707 (1964); *Chem. Abstr.*, **61**, 13775a (1964).

Some Reviews:

a) H.M. McConnell and B.G. McFarland, *Quart. Rev. Biophys.*, **3**, 91 (1970).
b) P.C. Jost, A.S. Waggoner, and O.H. Griffith in "Structure and Function of Biological Membranes," L.Rothfield, Ed., Academic Press, New York, N.Y., 1971, Chapter 3.
c) I.C.P. Smith in "Biological Applications of ESR," H.M. Swartz, J.R. Bolton, and D.C. Borg, Eds., Wiley-Interscience, New York, N.Y., 1972, Chapter 11.
d) P. Jost and O.H. Griffith in "Methods in Pharmacology," Vol. II, Appleton-Century-Crofts, New York, N.Y., 1972, Chapter 7.
e) C.F. Chignell, *Aldrichimica Acta*, **7**, 1 (1974).
f) A.D. Keith, M. Sharnoff, and G.E. Cohn, *Biochim. Biophys. Acta*, **300**, 379 (1973).

Spin labels, precursors and reagents:

15,568-3	3-Carbamoyl-2,2,5,5-tetramethyl-3-pyrrolin-1-yloxy, free radical	1g $16.00 5g $60.00
16,391-0	3-Carbamoyl-2,2,5,5-tetramethyl-pyrrolidin-1-yloxy, free radical	1g $12.05 5g $40.10
16,394-5	4-Amino-2,2,6,6-tetramethyl-piperidinooxy, free radical	1g $12.85 5g $42.90
17,614-1	4-Hydroxy-2,2,6,6-tetramethyl-piperidinooxy, free radical	1g $7.00 5g $19.00
17,948-5	4-Oxo-2,2,6,6-tetramethyl-piperidinooxy, free radical	1g $8.50 5g $28.00
11,573-8	4-Amino-2,2,6,6-tetramethyl-piperidine	5g $8.00 25g $30.00
11,574-6	2,2,6,6-Tetramethyl-4-piperidinol	10g $11.75 25g $19.55
11,576-2	2,2,6,6-Tetramethyl-4-piperidone hydrochloride	25g $14.10 100g $37.05
A6518-2	2-Amino-2-methyl-1-propanol	500g $4.00 1Kg $6.00
C6270-0	*m*-Chloroperoxybenzoic acid (Write for bulk prices)	25g $8.00 100g $23.50 1Kg $180.00

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