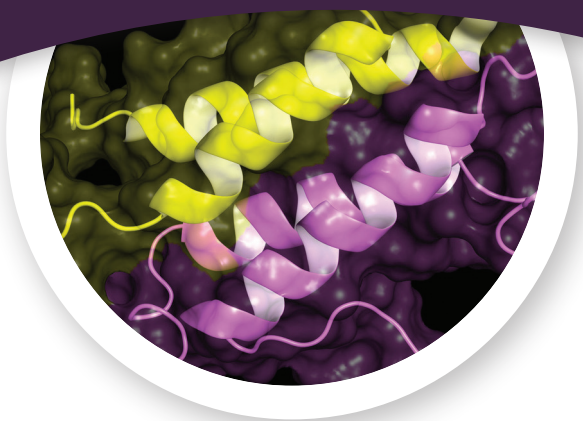
RESEARCH PRODUCTS

^{13}C-Enriched Carbon Sources for Solid State NMR of Proteins

• BioExpress® 1000 • Glycerol • Glucose



Tailoring ^{13}C Enrichment of Proteins for Solid State NMR

For many years, the use of highly enriched, uniformly isotope-labeled recombinant proteins has enabled the study of protein structure and dynamics by NMR spectroscopy. This approach has been relatively easy to perform since uniformly ^{13}C-labeled carbon sources such as $^{13}C_6$ glucose have been readily available. Unfortunately, uniform ^{13}C labeling of highly enriched proteins is not conducive to some NMR experiments (such as solid state NMR experiments using stationary aligned samples) because strong, homonuclear ^{13}C-^{13}C dipole-dipole coupling can act to broaden ^{13}C resonances very significantly, sometimes so severely that they are beyond detection. An effective approach to alleviating this problem is to use proteins containing spatially isolated ^{13}C sites. Such sparsely labeled proteins can either be produced using uniform, random, fractionally enriched carbon sources or specific ^{13}C-labeled carbon sources.

Uniform Fractionally ^{13}C-Enriched Bacterial Cell Growth Media and Glucose ($^{13}C_6$)

CIL is also pleased to offer fractionally ^{13}C-enriched BioExpress® 1000, as well as fractionally enriched glucose, for those researchers that use minimal essential media instead of a ready-made rich culture medium.

Catalog No.	Description	Amount
CGM-1000-CN-25-S	BioExpress® 1000 (^{13}C, 25%; ^{15}N, 98%)	10 mL (10x)
CGM-1000-CN-25	BioExpress® 1000 (^{13}C, 25%; ^{15}N, 98%)	100 mL (10x)
CGM-1000-CN-35-S	BioExpress® 1000 (^{13}C, 35%; ^{15}N, 98%)	10 mL (10x)
CGM-1000-CN-35	BioExpress® 1000 (^{13}C, 35%; ^{15}N, 98%)	100 mL (10x)
CLM-1396-25-1	Glucose (^{13}C, 24-25%)	1 g

The number of adjacent ^{13}C sites in most amino acid residues can be minimized by using uniform fractionally ^{13}C-enriched bacterial cell growth media or glucose [$^{13}C_6$]. Opella et al.[1] have reported optimal results using BioExpress® media with fractional ^{13}C enrichments between 25% and 35%.

Specific ^{13}C-Labeled Carbon Sources

CIL offers the following specific ^{13}C-labeled substrates for use in the microbial expression of proteins labeled with isolated ^{13}C sites.

Catalog No.	Description	Amount
CLM-1397	Glycerol (2-^{13}C, 99%	1g
CLM-1857	Glycerol (1,3-^{13}C, 99%)	1g
CLM-746	Glucose (2-^{13}C, 99%)	1g
CLM-441	Sodium bicarbonate (^{13}C, 99%)	1g

Glycerol [1,3-$^{13}C_2$] and glycerol [2-^{13}C] have been shown to give rise to complementary labeling patterns. When choosing the appropriate specific ^{13}C-labeled carbon source, the ^{13}C enrichment of the expressed protein can be tailored to highlight regions of interest. Sodium bicarbonate (^{13}C) should be added to growths using 2-^{13}C glycerol.

Advantages

Glycerol (2-^{13}C)

- labels alpha carbons
- increases overall labeling of carbons
- significantly lower levels of carbonyl and aliphatic sidechain carbons

Glycerol (1,3-$^{13}C_2$)

- creates reduced intensity in the α-carbon region.[1]

Glucose (2-^{13}C)

- minimizes adjacent ^{13}C pairs in most residues
- reported to be more useful than specifically labeled glycerol in detecting backbone ^{13}C resonances.[1]

Reference

1. Filipp, F.V.; Sinha, N.; Jairam, L.; Bradley, J.; Opella, S.J. **2009**. Labeling strategies for ^{13}C-detected aligned-sample solid-state NMR of proteins, *J Magn Reson, 201,* 121-130.