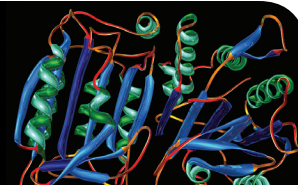


**CIL**Cambridge Isotope Laboratories, Inc.
isotope.com

BIOMOLECULAR NMR

Reverse Micelles

NMR spectroscopy of encapsulated proteins dissolved in low-viscosity fluids is emerging as a powerful supplement to traditional solution NMR approaches. Originally developed to overcome the slow tumbling problem presented by large soluble proteins,¹ the general approach of using reverse micelles has now seen applications in the study of integral² and anchored³ membrane proteins; proteins of marginal stability;⁴ protein structure,⁵ dynamics,⁶ and hydration.⁷ Nucleic acids have also been successfully investigated in this manner.⁸ The distinguishing feature of this approach is the nature of the sample. Spontaneously formed reverse micelles are the dominant vehicle for encapsulation and the low-viscosity short-chain alkane fluids are the dominant solvent with liquid propane and ethane being the most desirable.⁹ The availability of deuterated surfactants, co-surfactants and alkane solvents avoids the complications of large unwanted ¹H resonances that would greatly interfere with multidimensional NMR of encapsulated biopolymers in low-viscosity solvents.

References

- 1 Wand, A.J.; Ehrhardt, M.R.; Flynn, P.F. **1998**. High-resolution NMR of encapsulated proteins dissolved in low-viscosity fluids. *Proc Natl Acad Sci USA*, *95*, 15299-15302.
- 2 Kielec, J.M.; Valentine, K.G.; Babu, C.R.; Wand, A.J. **2009**. Reverse micelles in integral membrane protein structural biology by solution NMR spectroscopy. *Structure*, *17*, 345-351.
- 3 Valentine, K.G.; Peterson, R.W.; Saad, J.S.; Summers, M.F.; Xu, X.; Ames, J.B.; Wand, A.J. **2010**. Reverse micelle encapsulation of membrane-anchored proteins for solution NMR studies. *Structure*, *18*, 9-16.
- 4 Peterson, R.W.; Anbalagan, K.; Tommos, C.; Wand, A.J. **2004**. Forced folding and structural analysis of metastable proteins. *J Am Chem Soc*, *126*, 9498-9.
- 5 Babu, C.R.; Flynn, P.F.; Wand, A.J. **2001**. Validation of protein structure from preparations of encapsulated proteins dissolved in low-viscosity fluids. *J Am Chem Soc*, *123*, 2691-2692.
- 6 Simoneolis, A.K.; Flynn, P.F. **2006**. Fast local backbone dynamics of encapsulated ubiquitin. *J Am Chem Soc*, *128*, 9580-9581.
- 7 Nucci, N.V.; Pometun, M.S.; Wand, A.J. **2011**. Site-resolved measurement of water-protein interactions by solution NMR. *Nat Struct Mol Biol*, *245-249*.
- 8 Workman, H.; Flynn, P.F. **2009**. Stabilization of RNA Oligomers through Reverse Micelle Encapsulation. *J Am Chem Soc*, *131*, 3806-3807.
- 9 Peterson, R.W.; Lefebvre, B.G.; Wand, A.J. **2005**. High-resolution NMR studies of encapsulated proteins in liquid ethane. *J Am Chem Soc*, *127*, 10176-10177.