Self-diffusion of a protein confined in the bicontinuous phase of a microemulsion: A fluorescence correlation spectroscopy study

Ralph Neubauer,1,* Sebastian Höhn,1 Ralf Stehle,1 and Thomas Hellweg1

1Department of Physical Chemistry I, University of Bayreuth, Universitätsstr. 30, 95447 Bayreuth, Germany
*e-mail: ralph.neubauer@uni-bayreuth.de

The bicontinuous phase [1] in a microemulsion is often characterized by dynamic light scattering (DLS) or small angle neutron scattering (SANS).

Here we analyze the self-diffusion inside the water domains of a bicontinuous phase by fluorescence correlation spectroscopy (FCS) to determine the diffusion time and coefficient of tracer particles. FCS is a powerful technique for obtaining readings and results much faster than in an DLS experiment.

In the present work fluorescein labeled proteins are inserted in the water phase. By measuring the movement of the proteins the confinement effect can be identified.

Moreover we compare results from different DLS, SANS and FCS measurements for the bicontinuous phase of sugar surfactant based microemulsions. We also show conclusions for model systems and corresponding systems with technical-grade surfactants [2]. The challenge especially for technical-grade systems is the fluorescence of impurities in the surfactants all over the visible range which cannot be extinguished.
