canSAS-VIII, Apr. 14-16, J-PARC, Tokai, Japan

Single sided wall confinement of microemulsions with and without additive

H. Frielinghaus[1], F. Lipfert[1], M.S. Appavou[1], O. Holderer[1], A. Koutsioubas[1], S. Mattauch[1], M. Ohl[2] and D. Richter[1]

[1]Jülich Centre for Neutron Science, Forschungszentrum Jülich GmbH, 85747 Garching, Germany

[2]Jülich Centre for Neutron Science, Outstation at SNS, Forschungszentrum Jülich GmbH, Oak Ridge, TN, USA

E-mail: h.frielinghaus@fz-juelich.de

The grazing incidence small angle neutron scattering of microemulsions at planar walls was characterized in terms of structure [1] and dynamics [2] at a SANS instrument, a reflectometer, and a neutron spin-echo (NSE) spectrometer. Using the evanescent (tunneling) wave for incident angles below the critical angle of total reflection, a depth resolution could be achieved for all these experiments.

Bulk bicontinuous microemulsions show a lamellar structure close to hydrophilic planar walls. The number of perfect layers, the decay of the lamellar order, and the dynamics of the surfactant membranes was characterized. The dynamics were three times faster adjacent to the wall, which was connected to a modified theory of membranes in a viscous medium to additional confinement of the hydrodynamic field at solid walls, and the structural characterizations are connected to the depth resolved dynamics. A complementary study of microemulsions adjacent to clay platelets with varying diameter displayed the importance of the confinement of long wavelength undulations [3]. Adding amphiphilic polymers as efficiency boosters to this system [4], the near surface dynamics is slowed down, and the polymers are attracted to the first membranes adjacent to the wall through confinement effects.

A newly developed resonator enhances the intensity of the evanescent wave dramatically, and would allow for even more difficult experiments.

[1] M. Kerscher, P. Busch, S. Mattauch, H. Frielinghaus, D. Richter, M. Belushkin, G. Gompper, PRE 83, 030401(R) (2011)

[2] H. Frielinghaus, M. Kerscher, O. Holderer, M. Monkenbusch, D. Richter, PRE 85, 041408 (2012)

[3] F. Lipfert, O. Holderer, H. Frielinghaus, M.-S. Appavou, C. Do, M. Ohl, D. Richter, Nanoscale 7, 2578 (2015)

[4] F. Lipfert, H. Frielinghaus, O. Holderer, S. Mattauch, M. Monkenbusch, N. Arend, D. Richter, PRE 89, 042303 (2014)