Dynamics of liquid interfaces as studied by Drop and Bubble Micro Manipulator

J.Y. Won¹*, J. Krägel¹, A.V. Makievski², M.E. Leser³, D.Z. Gunes³, C. Gehin-Delval³ and R. Miller¹

¹ MPI of Colloids and Interfaces, D-14476 Potsdam/Golm, Germany
² SINTERFACE Technologies, Volmerstrasse 5-7, D-12489 Berlin, Germany
³ Nestlé Research Center, CH-1000 Lausanne 26, Switzerland
* e-mail: jooyoung.won@mpikg.mpg.de

The Drop and Bubble Micro Manipulator (DBMM) is a new tool for stability studies of international layers for instance, the interaction between two droplets or two bubbles or even between a single droplet with a bubble in a liquid medium [1]. It is conceived and designed as an additional module, to be adapted and inserted in the optical bench of the drop-profile analysis tensiometer PAT-1, in a similar configuration as that described recently for a combined profile-analysis and capillary-pressure tensiometer [2].

The simplest experiment is the approach of two droplets or bubbles against each other. The capillaries used can have identical or different tip shapes and diameters, and also the size of the drops/bubbles can be chosen according to the target with an identical or different size. The embedded routines provide the radius of the two menisci at both sides and the respective capillary pressures in real time. These values can be recorded in a file with a selected data acquisition rate. Also a video movie can be recorded simultaneously with the standard of 25 fps. Once the two drops of a desired size are formed, the xyz-stage allows moving the first drop towards the second one until both are positioned properly. This positioning can be just opposite to each other or also out of a common symmetry axis [3].

Various experimental studies have been performed to demonstrate the functionality of the DBMM. One of the targets is to measure capillary pressure before and during coalescence for systems containing surfactants, proteins and their mixtures in order to understand which surface layer composition prevents drops or bubbles from coalescence. Examples are shown for air bubbles in aqueous solutions containing food proteins such as β-casein (BCS) and β-lactoglobulin (BLG), and added surfactants.

Two air bubbles in an aqueous solution in direct contact

References