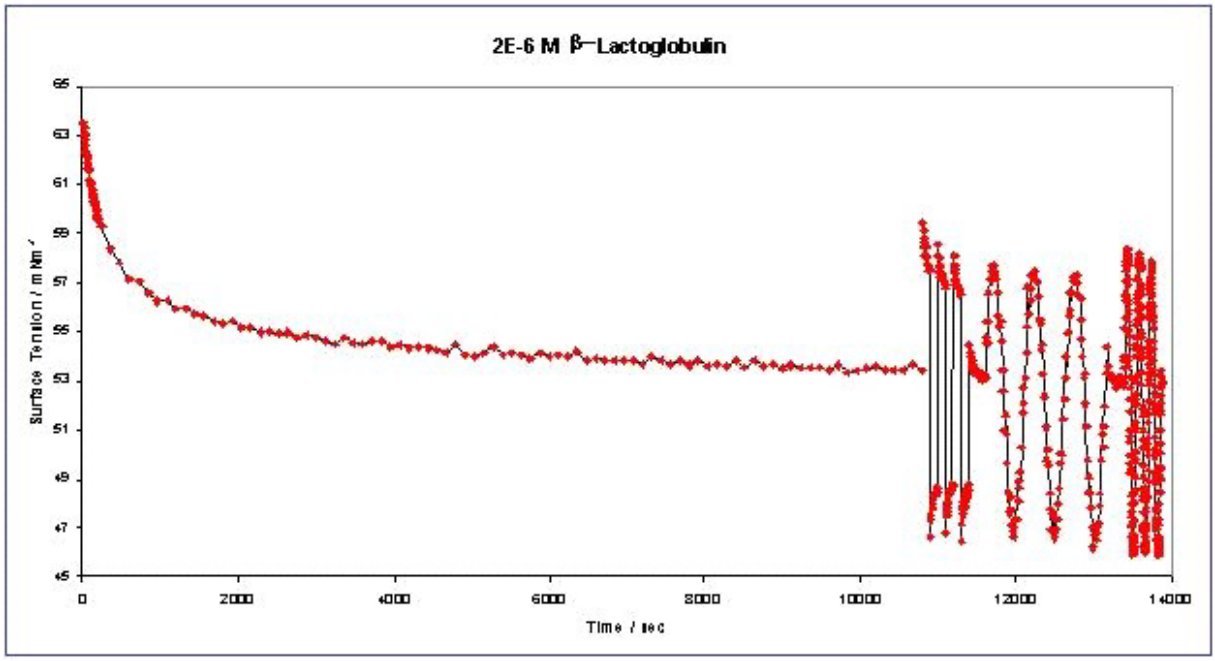
Dilational Elasticity and Viscosity from Oscillating Drops and Bubbles Using the Tensiometer PAT-1

Using the PAT-1 instrument, the dynamic dilational rheology of interfacial layers can be studied. During the experiments a drop or bubble is formed and kept constant. When the adsorption equilibrium has been reached relaxation experiments are started, in form of transient or harmonic perturbations. Note, these experiments can be performed at a water-air or water-oil interface.

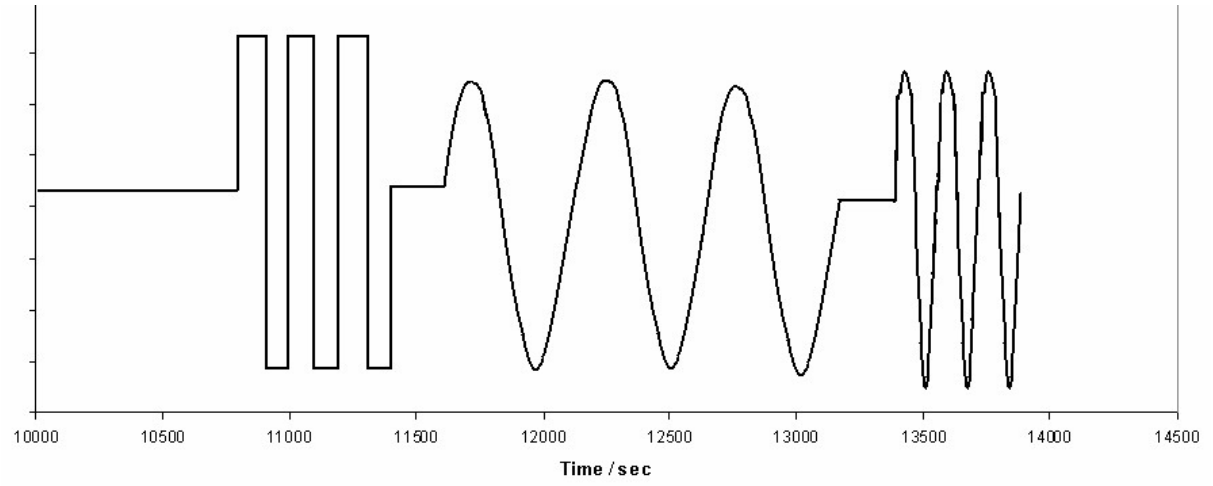
A typical experimental results has the following form, here obtained for an aqueous protein solution.



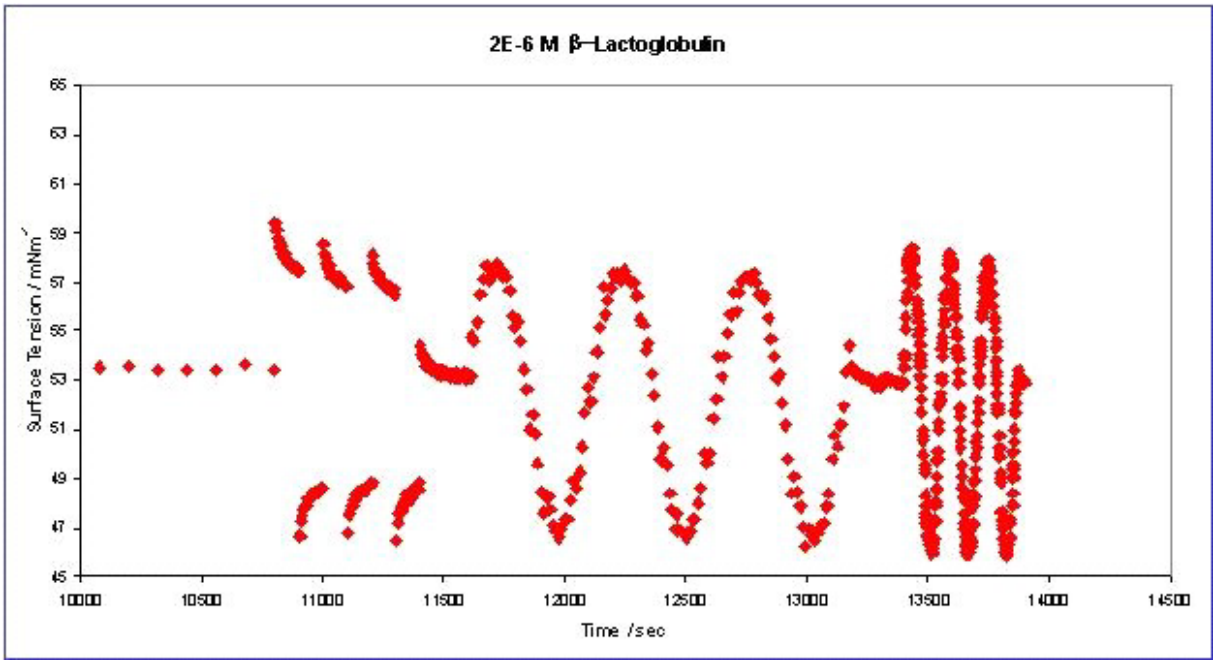
The software used to display the results graphically is MS EXCEL, as the data from PAT-1 can be easily imported into an EXCEL worksheet. After about 11.000 seconds an almost constant surface tension value is reached, i.e. the adsorption equilibrium is established.

The following graphics show the zoomed part of the experiment, the change of surface area of the drop during the relaxation experiment, and then the resulting surface tension changes caused by the expansion and compression, respectively.

Drop surface area change with time



Surface tension change during surface area perturbations



Using a theoretical model, the relaxation mechanism of the studied protein (or surfactant) can be analysed. Algorithms and procedures for such an analysis have been described in a book chapter recently published (*G. Loglio, P. Pandolfini, R. Miller, A.V. Makievski, F. Ravera, M. Ferrari and L. Liggieri, Drop and Bubble Shape Analysis as Tool for Dilational Rheology Studies of Interfacial Layers, in "Novel Methods to Study Interfacial Layers", Studies in Interface Science, Vol. 11, D. Möbius and R. Miller (Eds.), Elsevier, Amsterdam, 2001, p. 439-484*).

Our service:

- measurement of dynamic surface or interfacial tensions over a respective adsorption time until equilibrium has been reached
- performance of square pulse and sinusoidal perturbations in a frequency range between 1 Hz and 0.01 Hz
- data analysis and graphical representation
- Fourier analysis of the oscillation experiments
- compare with standard surfactants
- reference to literature data
- literature analysis to the subject