

# Dynamic properties of Span-80 adsorbed layers at paraffin-oil/water interface: capillary pressure experiments under low gravity conditions

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During the last years we have conceived, proposed and run a set of benchmark microgravity experiments to investigate the relationships between the features of emulsions and foams (foamability, stability, etc.) and the physical-chemistry of interfacial layers and liquid films.

Actually, from April 29 to August 08, 2014, a Capillary Pressure Tensiometer (denoted as FASTER) accomplished scientific experiments on liquid interfaces in a microgravity environment, operating on board of the International Space Station. The examined systems were oil/water interfaces (i.e., water/paraffin-oil and n-hexane/water) with different concentrations of standard non-ionic surfactants and at different temperatures. The experiments were aimed at the study of the interfacial dilational properties, also referred as interfacial rheological properties or interfacial viscoelastic properties.

Harmonic disturbances were imposed to the interfacial area of a liquid drop, issuing from a capillary tip into a surfactant-solution liquid-matrix, at different frequencies (from 1.0 to 100 Hz in the high-frequency range and from 0.01 to 1.0 Hz in the low-frequency range), at 3 successive different amplitudes (from 5% to 20%). Particularly in the low frequency range, at regular intervals, also square pulse disturbances were imposed to each studied system. In synchronism, the drop geometrical properties and the differential Laplace pressure were acquired.

The primary experimental results grant information about a) the transient and the equilibrium interfacial tension b) the equilibrium thermodynamic properties of the interfacial phases c) the mechanisms of surfactant adsorption, d) the molecular diffusion process, e) the transient and the steady-state interfacial viscoelastic properties, f) the linearity approximation of the interfacial behaviour. Moreover, the data validate the Fourier-Transform relationship between surface relaxation (time domain) and harmonic oscillation (frequency domain), within the linearity response range.

The advancement of the fundamental knowledge about the above-mentioned physical quantities for single interfaces is a preliminary step finalised to deepen the understanding of emulsions stability, as well as of foam stability, and then to improve a large variety of industrial processes.

The poster specifically illustrates the results obtained for the water/paraffin-oil system.

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