Linear and non-linear interfacial shear rheology as different approaches to characterise the surface film of proteins and surfactants

A. Torcello-Gómez¹, J. Maldonado-Valderrama¹, A. Martín-Rodríguez¹, M. J. Gálvez-Ruiz¹ and J. de Vicente¹

¹University of Granada, Campus de Fuentenueva sn, 18071, Granada, Spain.
*e-mail: julia@ugr.es

Proteins and surfactants at interfaces are known to behave very differently under shear deformation. The goal of this study was to compare their interfacial properties at the air-water interface by evaluating their rheological response under linear and non-linear regimes. Oil soluble surfactant, Span 65, and globular protein, β-lactoglobulin, were spread and adsorbed onto the surface, respectively. A 2D Searle-type measuring geometry with a biconical bob was used for measuring the interfacial shear rheology. This equipment provided the viscoelastic properties (interfacial shear storage and loss moduli) of interfacial layers. Also, the linear and non-linear rheology of these systems was studied by increasing the amplitude of the oscillation. Linear rheology showed that shear deformation is more sensitive to the strength of surface film. Furthermore, Large Amplitude Oscillatory Shear rheology, evaluated with Fourier transform rheology, indicated that the non-linearity increases with the molecular weight, and decreases with the surface concentration. This work demonstrates that non-linear shear deformation is demonstrated to provides new insight into key information about interfacial layers that can be optimised so as to fully characterise the surface depending of the type of film (spread or adsorbed). The is information provided is very useful so as to correlate the structure and the mechanical properties of interfacial systems.

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